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Alphabetical Index to Advertisers

American Conduit Co..... 34
American Creosoting Works.. 98
American Elec. Fuse Co...32-33
American Elec. Telo. Co..27-100
American Electric Works.....100
American Machine Telo. Co.. 40
Andrae Sons Co., The Julius...34
Austin, M. B. & Co..... 10
Automatic Electric Co..... 17

Baird Mfg. Co. 30
Beidler & Co., Francis..... 94
Belden Mfg. Co. 100
Beltrami Cedar & Land Co... 90
Benton & Co., Geo. P..... 92
Bissell Co., F. 16
Blake-Signal & Mfg. Co..... 99
Blakeslee Forging Co. 100
Brooks Co., Hall L..... 93
Buyers' Directory 6-7

Cadiz Electric Co. 16
Camp Co., H. B..... 42
Central Electric Co..... 20
Central Telo. & Electric Co.. 12
Century Telo. & Const. Co... 15
Chicago Telo. Supply Co....1-3-5
Chicago Writing Machine Co.. 28
Clark Electric Specialty Mfg. Co. 99
Classified Index 6-7
Clement, Edward E. 100
Commercial Elec. Supply Co.. 24
Conover & Co., Geo. W.....100
Coolidge Co., M. H..... 88
Crawfordsville Wire & Nail Co. 18
Cook, F. B. 9
Crowe Metal Mfg. Co..... 1
Crumb & Co., W. H.....100

Dean Electric Co..... 4
Dearborn Electric Co. 1
Duluth Log Co. 92

Electric Appliance Co. 25
Eureka Electric Co. 21
Ewing-Merkle Electric Co.... 30

Farr Telephone & Construction Supply Co. 98
Fowler, John H..... 94

Gemmill Telo. & Mfg. Co..... 34
General Engineering Co..... 1
General Insulate & Machine Co. 28
Globe Automatic Telo. Co..... 35

Harvard Electric Co..... 42
Hemingray Glass Co..... 12
Hipwell Mfg. Co. 8
Hodge-Walsh Elec. Engr. Co. 2
Holt Lumber Co. 89
Houston & Liggett 96
Huebel Co., C. J..... 96
Humbird Lumber Co..... 86

Illinois Electric Co..... 26
Illinois Electric Specialty Co.. 19
Independent Dry Battery Co.. 97
Independent Telo. Mfg. Co... 28
Indiana Rubber & Ins. Wire Co. 2
Indiana Steel & Wire Co..... 14
International Creosoting & Construction Co. 98
International Telephone Manufacturing Co. 100

Jones & Winter..... 1

Kemp, Roy W.....100
Kusel & Kusel Co..... 13
Klein & Sons, Mathias..... 1
Kusel Telephone Mfg. Co., D. A. 14

Lindsley Bros. Co..... 86

Matthews & Bro., W. N..... 93
McDermid Mfg. Co. 10
McMeen & Miller 2
McRoy Clay Works 1
Miller Anchor Co. 85
Minneapolis Cedar & Lumber Co. 92
Monarch Elec. & Wire Co.... 18
Monarch Telephone Mfg. Co.. 11
Moon Mfg. Co. 24
Morrison Lumber Co., J. W... 96
Mountain State Electric Co... 97
Mueller Company, Wm..... 94
Murdock & Co., W. J.....100

Nagel Elec. Co., W. G..... 1
Nash & Co., Geo..... 14
National Carbon Co. 95
National Telephone Supply Co. 98
National Wire Corporation.... 20
Naugle Tie Co., E. E..... 88
N. Y. Insulated Wire Co..... 1
Nungesser Electric Battery Co. 99

Okonite Co., Ltd. 85

Page & Hill Co. 92
Partridge Lumber Co., T. M.. 96
Pendleton & Gilkey 91
Perrizo & Sons 89
Pittsburg & Lake Superior Iron Co. 90
Plume & Atwood 99
Polk, Robert H. 8
Pontiac Engraving Co. 26

Raber & Watson 93
Roebeling & Sons Co., John A. 95
Rogers, Oscar Wentworth 36-37-38-39
Roth Bros. 18

Scoville Mfg. Co. 1
Seaman & Co., W. S..... 10
Spies Electric Co..... 42
Standard Telo. & Electric Co. 22
Standard Underg'd Cable Co.. 42
Stanton, L. W. 100
Sterling Electric Co..... 41
Sterling & Son, W. C..... 96
Stevens Co., Charles G..... 1
Stromberg - Carlson Telephone Manufacturing Co. 29
Swedish Am. Telephone Co... 42

Telephone Books 25-97
Telephone Hygienic Co..... 8

Valentine-Clark Co. 95
Veeder Mfg. Co. 99

Want Advertisements 97
Warner Electric Co..... 22
Western Electrical Co..... 85
Western Electric Co..... 91
Western Telephone Mfg. Co.. 31
Weston Elec. Instrument Co.. 85
Williams-Abbott Elec. Co.... 30
Wittenberg Cedar Co..... 94
Worcester Co,, C. H..... 87
Wright Bros. 87

Yesbera Mfg. Co. 26
Yonkers Specialty Co.....100

Telephony.
AN ILLUSTRATED MONTHLY TELEPHONE JOURNAL
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Telephone Construction Practice

H. J. MINHINNICK

CHAPTER II.

SURVEYS, LOCATIONS AND MAPS.

THE gravest fault attending the construction of many, in fact, most telephone plants in the earlier days, was that they were not built by engineers. While no one in his sober senses would attempt to build a railroad or canal without detailed maps and plans carefully and accurately prepared in advance, it was common practice to turn a construction crew loose in a town and expect them to build a good plant "out of their heads," or at best, from plans hurriedly prepared. The engineers of those days confined themselves entirely to switchboard and instrument circuits and the outside plant was left at the mercy of the so-called practical men, with results more easily imagined than described. Pole lines were run at random, cables installed by guess, conduits built without reference to future needs, in fact, "rule of thumb" was the only rule recognized.

The exchanges that have paid the penalty for such work are most easily counted by taking the number of plants rebuilt within the last three or four years, for if there is an Independent exchange in the United States which has gone six years without rebuilding the writer does not know where it is. The very necessities of the case have evolved a large group of engineers whose specialty is construction work and who bring to their chosen branch of the profession fully as great technical skill as is shown in the other departments. It is now common practice to build the plant on paper to the last detail before a single pole is set or a single station wired, and surely this is the only correct method.

Ordinarily, as soon as the franchise is secured, subscription solicitors are put in the field, and while they are at work the plans should be in preparation. The first requisite is a large scale map of the city, and as a general rule this must be made from such other maps as are available by a process of enlargement. Ordinary city maps are drawn on a scale of from 300 to 500 feet to the inch and are altogether too small to be of any use. The insurance survey maps are the most accurate, as a rule, and in most cases are readily procurable; besides these there is generally a published atlas and other printed maps.

The first step is to prepare a map of the entire city on such a scale (ordinarily about 300 or 400 feet to the inch) as will permit the entire territory to be covered by the plant to be shown on one map of convenient size for handling. Of this map at least half a dozen white prints should be made, and as soon as this is done all the subscribers of the existing telephone company should be dotted in on the original tracing and three or four more prints made showing these subscribers. This is something of a task, but the city directories always explain how the streets are numbered, and if the draughtsman will mark two or three rows of numbers both ways across his map it becomes a simple matter to dot the subscribers in correctly. The directory also will furnish the locations of all office buildings, so there is little or no excuse for omitting a single subscriber. The reason for thus listing the subscribers of the old company is that it is safe to assume that practically all of these will become patrons of the new exchange and that the new distribution will follow the broad general lines of the old. It must be remembered that the old company represents the growth of many years and that such increase of subscribers as the new company is entitled to look for must come rather in increase of numbers along the old lines than in the opening of new territory. At all events, this map will show the general distribution of the subscribers and will indicate the various districts into which lines must be run and the comparative weight of the leads.

The theory of line location is exceedingly simple, but, unfortunately, in practice, it becomes so complicated by obstructions that it is rendered one of the most difficult problems imaginable. This theory requires that each subscriber shall be brought to the cable terminal by the shortest and most direct route and that the cable shall reach the exchange in the same way. If there were no existing pole lines and if city councils never perpetrated the crime of vacating alleys and streets there would be no difficulty, but unfortunately in the ordinary city exchange the streets and alleys already are encumbered by anywhere from three to six sets of poles, and not infrequently a block or two of an otherwise clear run has been vacated by the council at the request of private citizens or corporations.

Notwithstanding this, however, the best practice undoubtedly is to lay down on the map referred to a complete system of "proposed lines" reaching every subscriber shown, and then make a survey to determine such changes as are required. The boundaries of the underground district are generally specified in the franchise, but, of course, this indicates only the minimum, and there is no objection to extending these limits as far as desirable. The franchise also, as a rule, contains a provision that the pole lines shall run in the alleys where possible—this is the better practice in any event, as it leads to fewer complications in such matters as guying and tree trimming, and most residence owners prefer very rightly to have the drops enter their houses from the rear. So soon as the "proposed lines" are put on

the maps, a rapid survey should be made by driving over each line to determine if it be practicable, and if, for any reason, it be found impossible to follow a certain line, or if an examination show a more economical method of reaching the same territory, the new line can be sketched in on the ground.

As soon as the entire system is traversed in this way, the scheme of lines will begin to assume practical shape, and a new map can be made showing the alterations. As illustrating how this works out in practice the two maps reproduced herewith are given. Fig. 1 shows the "proposed lines," and Fig. 2 the lines as finally built. It will be observed that the proposed lines have in this case been actually turned at right angles. This is a rather extreme instance, and is selected for that very reason; it may be added that these maps are actual reproductions of portions of two maps made by the writer's company on one of its contracts and that the changes indicated were made for a variety of rea-

FIG. 1.—PROPOSED LINES.

sons, the chief one being that two of the north and south alleys had been vacated for half a block.

As soon as the new line map is completed, a rough scheme of cable distribution should be worked out and the cables and terminal poles indicated. It is understood, of course, that the sizes of the cables are not settled at this time, but merely their locations and the locations of the terminals, but at the same time great care should be taken in selecting the distributing points, as it will be found an expensive matter to change them later on. Fig. 3 illustrates the method of fixing the terminal points. A reference to this map will show that beginning at the end of the lead to the west and counting south to the main lead we have eleven subscribers shown; a cable should, therefore, extend along Fourteenth street to the corner of Ross, and we accordingly locate a distributing point there, as shown. Counting from the north on the George street lead and its branch to the east, we find twelve subscribers north and east of Eighteenth street, and locate the cable pole, as shown. It is evident that a distributing point must be placed at the corner of George and Fourteenth streets, and another at the intersection of the alley in the next block east. Had all the alleys to the north been open the leads would have been carried entirely in them and the cable poles located at the alley intersections, but, as shown by the map, two of these alleys (on either side of George street) are impassable, and the line is of necessity placed in the street. This process of cable location is continued until the line reaches the under-

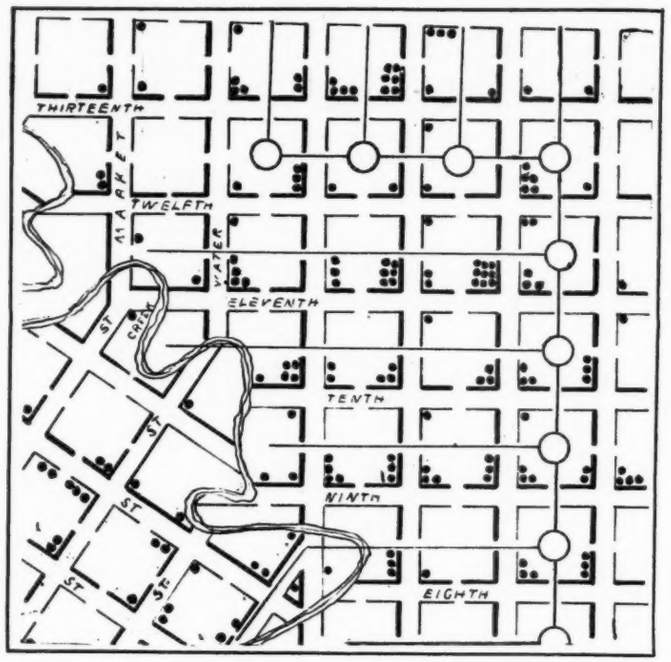

FIG. 2.—ACTUAL LINES.

ground system and is repeated with each lead in the city.

The location of the pole lines and cables having been thus fixed, the next step in order is the listing of the poles required. This is necessary in order that the poles may be ordered as soon as possible, for it takes considerable time to get these on the ground. Before going into the detail of this matter it may be well to say that for the sake of uniformity of office records all survey notes should be made in standard field books and that these notes should be so plain that an outside engineer coming on the ground

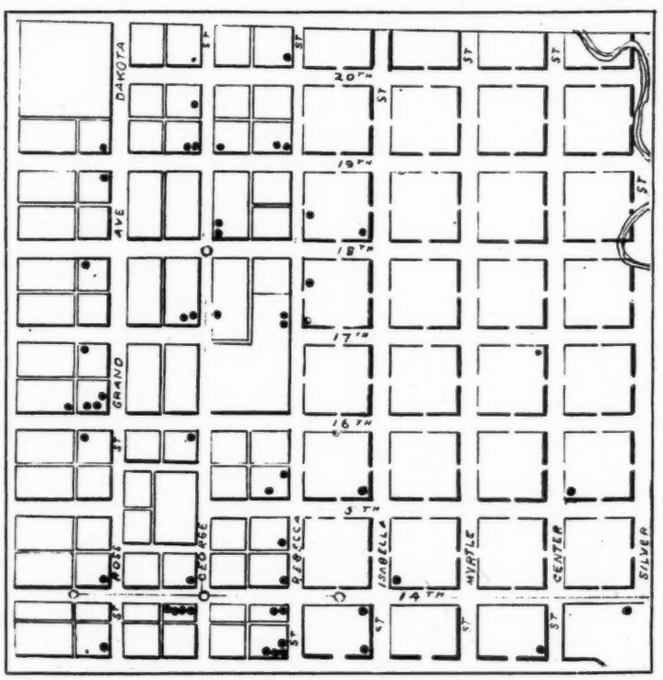

FIG. 3.—CABLE LOCATION.

would readily understand them. As a well known authority says:

"The field notes should have one and only one reasonable

interpretation and that the correct one. They should be perfectly legible and easily understood by anyone at all familiar with such matters."

"Careful attention should be given to the *legibility of numerals.*"

"No item properly belonging to the notes should be trusted to memory."

"Sketches will be used liberally in the notes and will be made *in the field.*"

These maxims are well worthy the attention of every superintendent. The form of book is immaterial, but any of the standard patterns of transit books are suitable. It is the writer's practice to keep four books on each plant—"Pole Lines," "Subway," "Cables" and "Miscellaneous"—which contain every note made on the work.

To return to the subject in hand, the first poles to be listed may be the distributing poles in the underground district, or, as they are generally called, the "can" poles. These should be specially ordered and should be the largest and choicest poles on the works; as to their length, Bell practice seems to be to set extremely high and heavy poles, but the writer must confess that he could never see the philosophy of setting a 75-foot pole when the highest existing lead is on 45s. A heavy pole, high enough to afford a good clearance for the drops, is all that is required, and it is rare that a 55 or 60-foot pole will not meet the necessities of the case. If very high distributing poles have been set by the old company, it will, as a rule, be necessary to set shorter ones, and so clear under their drops. The specifications for these poles will be taken up subsequently.

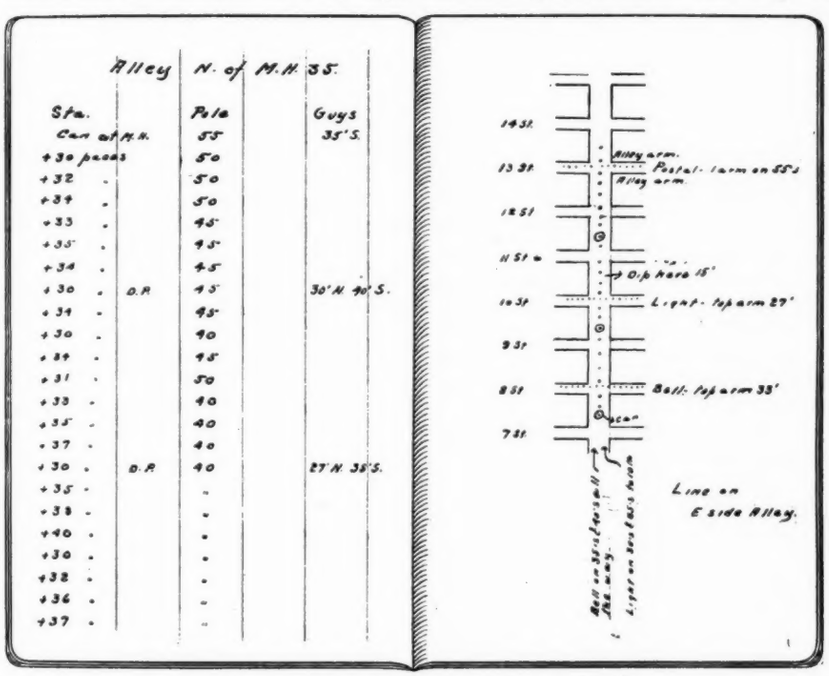

FIG. 4.—POLE LOCATION FIELD NOTES.

The system of aerial lines will be gone over, lead by lead, commencing at the point where each leaves the underground district. Accompanied by a lineman and the city foreman, the superintendent should walk over each line and note in his field book the length of each pole required and the distances between them, the height of all other leads crossed over or under or run along (which height must be measured, not guessed at) and such other data as he deems necessary. The distances may be paced for the purposes of this survey. A sample page of such notes (Fig. 4) is herewith reproduced.

An inspection of this page of notes shows clearly the following information: That the alley is already occupied on the west by the Bell and on the east by the electric light company as far as Tenth street, and that the new line is to run above the latter; that on Eighth street a Bell lead is crossed over, their top arms being 33 feet above the ground. The light lead is similarly crossed at Tenth street, and the Postal lead crossed under at Thirteenth street; that the "can" pole can be anchored 35 feet to the south; that beginning at the "can" pole the distances from pole to pole are 30, 32, 34, etc., paces, and the poles required 50 feet, etc.; that the cable pole between Ninth and Tenth streets can be anchored 30 feet to the north and 40 feet to the south; that the houses on either side of Thirteenth street are built so close to the alley line that alley arms must be used, and that between Tenth and Eleventh streets there is a considerable dip in the profile, estimated at fifteen feet, which also is shown by the list of poles, which in this block run 40, 45, 50 and 40 feet. In fact, from these notes all the information necessary to build the lead is readily available, and when the entire system has been traversed in this manner it is possible (1) to plat the pole lines complete, including guys and anchors, and (2) to order the exact number, sizes and lengths of poles required.

In fixing the lengths of poles nice discrimination is necessary, for the superintendent must always bear in mind that it is a most important part of his duty to save his employer's money. He will, therefore, use poles as short as will meet the requirements of first-class construction, bearing carefully in mind the fact that it is an easy matter to waste hundreds of dollars on this one item. He must secure a good clearance over all obstructions, at least five full arms and two feet in addition, except at the extreme ends of the leads, where perhaps three arms clearance will be found sufficient. Also in approaching a cable pole, less clearance is demanded than when leaving it, for there can never be more than one arm occupied at such a point and all that must clear is the cable. The line must, of course, be well graded and adjacent poles should have their tops within at least five feet of the same horizontal plane. In other words, a pole set at the bottom of a 15-foot depression in the ground should be at least 10 feet longer than the poles on the high ground at each side. As a rule, however, it is possible to avoid setting a pole at the extreme low point by varying the adjacent spans so as to bring a pole half way down the slope on either side. In ascending or descending a long regular grade the poles may follow the contour of the ground and no special grading is necessary. Considerable practice is required to determine the grade of irregularities in the ground, and in extreme or doubtful cases an instrument must be used. This may be the regular engineer's level, or better still, the little hand level, with which any grade can be measured with sufficient accuracy for pole line purposes as fast as the ground can be walked over. This little instrument costs but four or five dollars and should form part of the equipment of every superintendent, as he will find innumerable uses for it, and he will find that it will pay for itself many times over.

It must not be imagined that it is necessary to clear over every intersecting lead. Whenever there is plenty of room beneath it is good practice to run there, but care should be taken to leave ample space above the new wires for any possible circuits the other line may require. It is especially desirable to cross under electric light or other high tension circuits, and this for several good reasons. In the first place their wires are far less apt to break down than tele-

phone wires and should such an accident occur the onus is on them. In the next place the danger always attendant on stringing messengers, cables and wires across high tension circuits is avoided; and lastly, there is no danger of interrupting their service by an accidental short-circuit or ground.

In locating terminal, junction or corner poles care must be taken to provide for the guying, and no such pole should

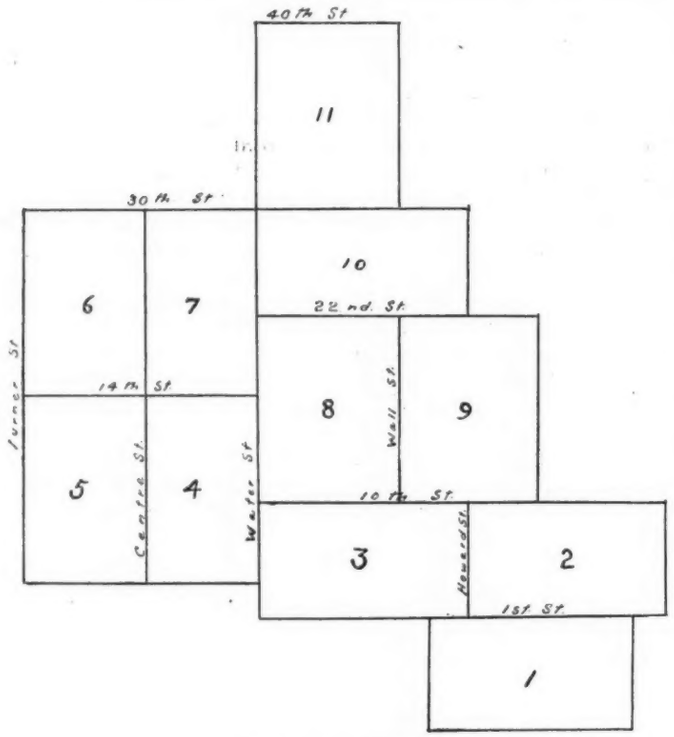

FIG. 5.—MAP INDEX.

finally be located until this matter is definitely settled. Even in alley construction it is highly desirable that all poles be set as nearly as possible on lot lines. In street work this is an absolute necessity. Close watch must be kept for gates and private driveways, and especial pains must be taken to see that guys will not interfere with driveways or barn doors. It seems hardly necessary to add that due consideration should be given to the probable weight of the lead when fixing the size of poles. It is a safe rule that cable should never be strung on poles shorter than 40s, nor with lighter tops than eight inches. If on shorter poles there is considerable danger to be apprehended from house movers, and in case of sleet, the heavy tops are the very best insurance that can be imagined. So also, no lead that will ever carry more than one arm should run on 30-foot poles, in fact, modern practice has well nigh eliminated this length, and for short spur leads carrying two or three pairs with little or no possibility of increase, good, straight, stubby 25s are much to be preferred to the usual slim and crooked 30s. The distance between poles should never exceed 125 feet, and on heavy leads should not average over 110 feet; in fact, many of the best companies insist on an average of only 105 feet.

By the time these surveys are completed the draughtsman will have finished his large scale maps, and the solicitors should be able to turn in a large proportion of the subscribers' names and addresses. The large maps should be on a scale of 100 feet to the inch, and as they will be in constant service they should be made of the heaviest and finest drawing paper, mounted on muslin. This paper may be had already mounted in rolls, 56 inches wide, at about $1.50 per yard, and as it will stand all kinds of rough handling, erasures, etc., it is well worth the price. A good many sheets will be required to cover the territory and each sheet should repeat on all its margins one street of the next—that is, if we suppose First street to be the dividing line between sheets one and two, this street should appear on both maps, and so on with the other three boundaries. The edges of the maps should be neatly bound with white tape, and a drawer should be provided (preferably in the large drafting table) for their accommodation. A convenient size for these maps is 56x40 inches, so that when folded once across they measure 28x40 inches. The drawer should be at least two inches larger each way than this. A sketch showing the arrangement and boundaries of the sheets should be placed on the corner of each, as should also its number, so that any map wanted may be easily reached. One of these index sketches is here reproduced and speaks for itself.

The maps being completed, the first step is to enter the pole lines from the field books. A tiny circle may be used for this purpose and each pole should be put in to scale from the paced measurements and its size marked, but the distances between the poles will not be indicated at this time. As the circle is hardly smaller than an eighth of an inch, and the paced distances cannot possibly be in error more than a foot or two, it is evident that even on a 100-foot scale no noticeable mistake can be made in locations. The cable poles may be indicated by a double circle, the anchors by a square and the stubs by a circle similar to that used for the poles.

While this work is in progress the subscriber's record will be made up from the solicitor's lists. This record

No.	Subscriber		Wire Chiefs O.K.	Wired	Drop Run	Line Run	Inst Set	Inst No	Rack No
1	Abbott C.E.	1021 - 7th		8/11	11/15	12/20	2/5	875 Wall	975
2	G.W.	421 Stewart		8/14	11/10	12/25	2/6	109 Wall	1124
3									
4									
5	Acheson Robt.	507 - 10th		Moved from City. Simmons Inc # 3176 now at this place					
6									
7									
8	Adams Jno W.	1st Nat. Bk. 8/14		Turn back. Going to leave City					
9	"	O.I. Co.	811 - 4th	9/16	11/30	1/6	2/11	1102 Wall	2116
10	"	P.X.	1026 - Jones	9/21	11/30	2/6	2/17	576 "	2124

FIG. 6.—SUBSCRIBERS' RECORD.

should contain the names and addresses of all subscribers in alphabetical order and should be kept in a substantial and well bound book. A five-column cash book is very convenient for this purpose, as it requires no additional rulings and is of good, substantial construction. The form of headings used by the writer is illustrated and requires no further explanation. In entering the names care must be taken to leave plenty of blank spaces for future names, so the alphabetical sequence may be preserved, and to this end the names in the directory of the old company afford an excellent guide. As illustrated, each line is numbered serially, whether occupied or not. In this way no confusion of

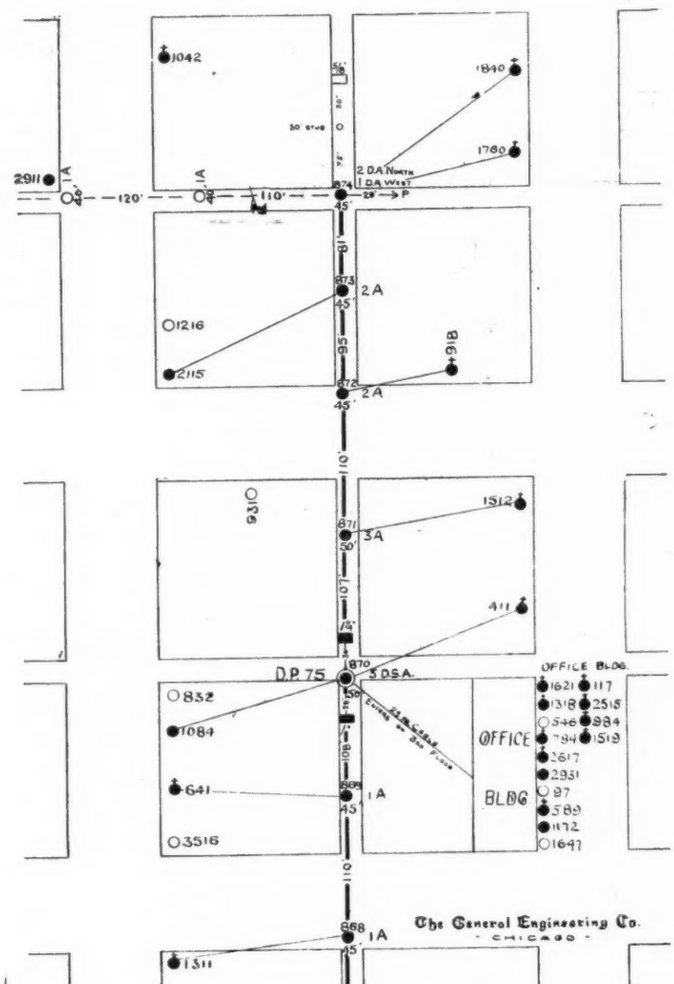

FIG. 7.—MAP SHOWING PROGRESS OF WORK.

numbers can possibly arise. As soon as this record is made, the subscribers should be entered to the map by number. A circle similar to the one used for poles may be adopted for this purpose and the remarks before made as to the method of locating the subscribers of the old company on the first maps are applicable here as well.

When the maps are advanced to this stage we have the following state of affairs: (1) Every pole is located; (2) cable poles are determined; (3) all guys are indicated, and (4) each subscriber is shown exactly where he belongs. In other words, the "paper" plant is complete, save only in two particulars—the sizes of the cables are not determined nor the capacity of the underground system. It is hardly necessary to add that as new subscribers are obtained they will be entered on both maps and record. It may well happen that the subscribers' lists will occasion the setting of some further poles, in which case the same routine as before will be gone through. A small section of a map of this sort is here illustrated, and the method of working out the detail is plainly shown in the "scheme" at the foot. It is evident that a map of this kind can be made to show, day by day, the exact progress of the work, and the labor involved is surprisingly little.

Taking the various steps in order, we have the following sequence: (1) The bare map; (2) the poles indicated by small open circles and their sizes marked; (3) the cable poles indicated by double circles; (4) the stubs and anchors shown by open circles and squares; (5) the subscribers located and numbered; (6) the circles showing poles filled in solid when the poles are set; (7) the subscribers similarly treated when the stations are wired; (8) the poles numbered serially and the exact distances between them indicated (this being accomplished by having an assistant with a couple of men go over the leads as soon as the poles are set, stencilling each pole with its serial number and making the necessary measurements); (9) each anchor "square" filled in solid as fast as the anchors are set; (10) each guy set plainly shown, including its size and length; (11) every cable entered, both before and after being placed in position; (12) the cross arms required for each pole marked beside it; (13) each drop shown running from the correct pole; (14) each instrument set indicated by a tiny cross above the wired subscriber's dot.

It is evident that if this work be done carefully and systematically and be kept constantly up to date the office records will show at any time the exact condition of the plant, and that any desired information may be had without difficulty. In no other way can this be accomplished, and as stated before, the work involved is trifling in comparison with the benefits derived. More important than this is the fact that explicit directions can be given to the foremen for each day's work; the inside wiring crew can be given a list of names and addresses every morning and will report on them at night; the cross-arming foreman will receive a list of pole numbers showing exactly how many arms go on each pole, and so on with all the other crews. No responsibility other than doing good work is imposed on the foremen, and they are able to devote their whole time and attention to this one point.

The capacity of the subway system must now be decided upon. To do this a tentative scheme should be drawn up, the only object being to determine how many cables enter the underground system at each point. As modern cable practice calls for underground cables as large as 400 pairs, and aerial up to 250 pairs, this is an easy matter, for a mistake of 25 or 50 pairs in any direction will make but little difference. The duct capacity should be worked out from the ends toward the exchange, and if the system is to be used solely for telephone purposes a safe rule to follow is, to allow three empty ducts for every one in use. This rule is, of course, subject to the limitations of common sense—thus, if a line of ducts is to feed only two or three blocks with no outlet to the aerial system, it would be wasteful folly to follow the rule strictly, and on the other hand, a line feeding a very large aerial territory may well have more vacancies than our rule calls for. As in all problems relating to capacity, it is best to err on the side of ample space, but the error, if any, should be small. A common mistake is to lose sight of the fact that a 400-pair cable leaving the exchange will of necessity serve a considerable territory, and this is one of the chief reasons for preparing a rough cable scheme before laying out the conduits. The

writer has seen two or three underground systems in which one or two ducts were dropped at each manhole, with the very natural result that the plant was entirely too heavy at the exchange and too light at the outer ends. Underground construction represents a large investment, and there is no sense in making in unduly onerous. Of course, if ducts are to be rented to other companies, sufficient provisions for their wants must be made.

The manholes should be definitely located at once and accurate measurements made of the distances between them, so that the conduit may be ordered early. As this work is done, notes will be made of the various items of information that will be of subsequent service. It is the writer's practice to prepare the underground field book in advance by making a plan of the streets or alleys to be occupied by the ducts, one run to each page, and to make a careful preliminary survey of the route. A page of such a note book is illustrated and affords a good idea of the methods employed. A small map of the underground district, showing only the locations of manholes and the number of ducts between each, should be made as early as possible, and at least ten or a dozen prints taken from it, so that every foreman engaged on the subway may have a copy.

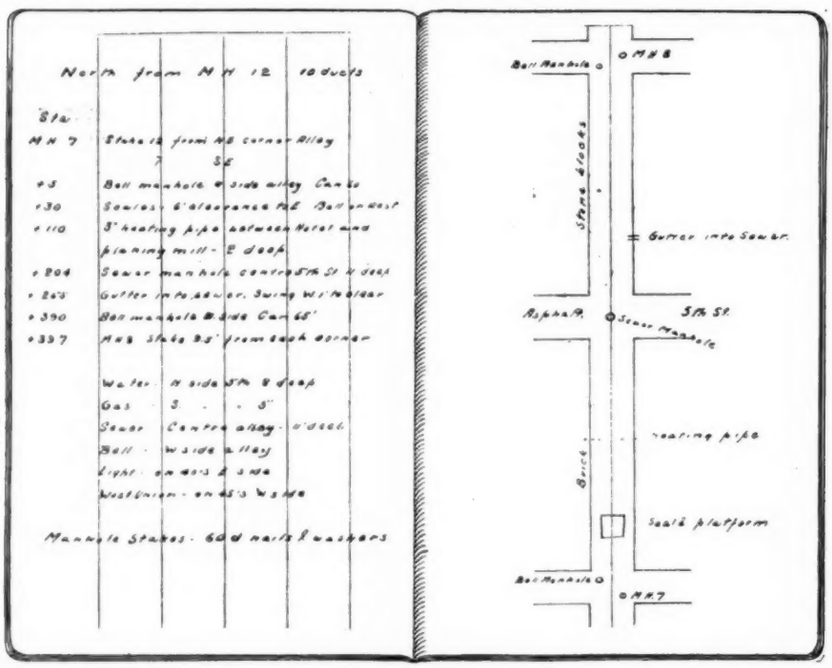

FIG. 8.—SUBWAY FIELD BOOK.

Before making the preliminary subway surveys all available data relating to water and gas mains, sewers, district steam heating pipes, etc., should be obtained and all maps of these systems should be carefully examined. In this connection, a word of warning may well be given. While these maps may have been accurate when made, changes of street and alley grades may very possibly have rendered them entirely misleading. Every conduit man will recall instances where he has run squarely into a main which the maps showed to be safely out of his way. In important cases, as where a heavy lead of ducts is to cross a main, it is a wise precaution to ascertain its exact depth by digging down to it before laying out the plans. One other hint may not be out of place—never pass a manhole of any kind without taking a look into it and finding just what it is and where it reaches. The writer has a vivid and painful recollection of having once disregarded a harmless looking manhole cover on the other side of the alley, and of afterward running into a vault which blocked the entire underground right of way. A sharp lookout should also be kept for gutter pipes discharging direct into the sewers, and for private heating plants, both of which are apt to present considerable obstacles unless foreseen and provided against.

By the time these matters are all attended to, material and tools will have begun to arrive and the active construction work will begin. While the making of these surveys has been a task of no small magnitude, the reward comes the moment active work is begun, for there will be no annoying delays due to the absence of plans, the work will be all laid out in advance, and the superintendent will be able to devote his whole time and attention to the work itself, instead of having to spend part of his days and most of his nights attempting to keep the plant laid out ahead of the several crews.

The final details of pole, cable and subway surveys will be taken up in the chapters devoted to these subjects.

This is the second of a series of twelve articles by Mr. Minhinnick on the outside construction of a telephone plant. The next article will treat of tools.

TELEPHONE HABITS IN BIG CITIES.

In the offices of the great telephone companies statistics are kept from which charts are plotted showing how the telephone is used in the different exchanges at different hours of the day. The convenient talking instrument is very little employed in early morning or late in the evening, but during the working day the rise and fall of the curves that represent the fluctuations in the number of calls makes an entertaining study.

Among many other facts these plotted curves reveal the great difference that exist in the business customs of American cities. A comparison, for example, of the charts of the Broad street exchange, New York, and the main exchange, Chicago, on almost any given date will prove, what is generally known, perhaps, that Chicagoans put in a longer if not more strenuous day than New Yorkers. The "traffic curve" in the western metropolis begins to rise about 8 o'clock and reaches its forenoon maximum of calls about 9. The "load," as it is designated by the telephone engineers, stays heavy through the morning hours, dropping at about 1 to the noon minimum, which is universal, and then mounting well up again through the afternoon until 5, after which it falls rather gradually till 8 o'clock.

A characteristic curve of the great downtown New York exchange, which includes about all the offices of the Wall street district, reveals that business men in Gotham go to their offices a full hour later than in Chicago. The highest peak is reached at 10 o'clock. The noon hour apparently begins a little earlier than in Chicago, though the lowest point of the noon depression is reached at exactly the same time. Evidently more New Yorkers go home shortly after luncheon, for the afternoon load is relatively not so high in New York as in Chicago. The curve also drops more rapidly through the afternoon, and at 7 o'clock less business is being done by belated officials than must be the case in the neighborhood of the Chicago main exchange.

Such differences as exist between New York and Chicago appear in the curves of other cities. In general it may be said that the tendency in the eastern cities is toward shorter hours than prevail in the west. Boston and Washington very closely follow New York in their telephone habits, while the average day's curve of Cleveland or Denver is not far different from that of Chicago.

Conventions of Independents

DISTRICT MEETINGS OF OHIO INDEPENDENTS.

REPRESENTATIVES of the fifty-six Ohio companies operating in the counties of Ashtabula, Cuyahoga, Erie, Geauga, Huron, Lake, Lorain, Medina and Trumbull, comprising District No. 1 of the Ohio Independent Telephone Association, met Tuesday, February 14, in the office of James B. Hoge, vice-president of the district, in Cleveland. The meeting was called to order by Mr. Hoge, who stated briefly the purposes, and a discussion was immediately opened upon topics of importance to the telephone men present. This discussion was general and very interesting and was participated in by M. B. Overly, Cleveland; W. B. Woodbury, Cleveland; G. W. Verner, Findlay; G. M. Grauel, Painesville; C. Y. McVey, Cleveland; O. F. French, Cleveland; E. L. Coen, Vermillion; J. B. Rhodes, Zanesville; E. C. Branson, Wellington; J. B. Hoge, Cleveland; A. S. Hillhouse, Canton; E. G. Miller, Warren; G. R. Callaghan, Bellview; B. H. Lang, Washington Hyde and others.

The following committees were appointed by the chair:

Committee on Nominations of Officers—Vice-president of District No. 1, delegate to state convention to be held in Columbus, March 30, delegate to national convention to be held in Chicago June 20 and 21, Washington Hyde, Warren; O. F. French, Cleveland; C. R. Grauel, Oberlin.

Committee on New Members—E. C. Branson, Wellington; C. L. Norton, Cleveland; C. R. Callaghan, Bellview.

Committee on Press—W. B. Woodbury, Cleveland; C. N. Grauel, Painesville, and E. G. Miller, Warren.

The committee on nominations presented the following. which were unanimously endorsed by the meeting:

For vice-president District No. 1, E. G. Miller, Warren. Delegate to national convention, C. N. Grauel, Painesville. Delegates to the state convention: Cleveland, J. B. Hoge, C. Y. McVey, W. B. Woodbury, O. F. French; Ashtabula, S. R. Newberry; Conneaut, S. H. Graberger; Geneva, E. V. Howes; Rock Creek, T. M. Corell; Chagrin Falls, L. A. Hubbell; Bainbridge, O. F. Post; Berea, W. W. Bolles; United States Telephone Company, M. B. Overly, C. L. Norton; Huron, C. E. Fey; Sandusky, Carl C. Curtiss; Vermillion, E. C. Coen; Burton, S. F. Oviat; Chardon, Dr. Pomroy; Bellview, T. E. Knapp, C. R. Callaghan; Painesville, C. M. Grauel; Mentor, F. E. Cadle; Willoughby, Fred Storm; North Madison, E. E. Corlett; Perry, C. C. Cook; Kirklin, E. Criswald; Elyria, S. E. Brush; Lorain, A. V. Hageman; North Amherst, G. E. Steel; Oberlin, C. R. Graham; Wellington, H. P. Dougherty; Medina, B. C. Hendrickson, T. R. Cookston; Orangeville, Dr. Fenton; Warren, E. G. Miller, Washington Hyde.

James B. Hoge, who has been vice-president of the district for the past year, declined a renomination, as his duties as president of the National Association take up his entire time. His successor, Mr. Miller, is one of the pioneer Independent operating men of the state, with large holdings of telephone properties.

The meeting of District No. 8 of the Ohio Independent Telephone Association was held at the Boody House, in Toledo, Ohio, on February 15. Vice-President R. E. Hamblin presided as chairman of the meeting. D. A. Yoder was elected secretary.

There are in this district thirty-seven exchanges. Out of this number twenty-five were represented, beside a number of visitors. The meeting was enthusiastic throughout and proved to be very profitable to all present. The following subjects were discussed, quite a number taking active part in the discussions:

The best method of advertising.

Shall we standardize the directory, and how often is it necessary to publish?

Is it necessary, and what is the best way to readjust rates?

What are standard rules and regulations?

What are standard forms of accounting?

Division of territory, and development of new territory.

Is it wise to introduce the meter basis of charging for telephones?

The following persons led in the discussion of the above subjects: William Morrison, Bryan; T. J. Carbin, Bloomville; Mr. Newman, Bowling Green; J. G. Steinkamp, Elmore; Messrs. Stinson and Brailey, Toledo.

A resolution was passed, authorizing the vice-president, R. E. Hamblin, to fix a date and extend a general invitation to the operators of the various exchanges in the Eighth District to meet in Toledo, Ohio, for the purpose of inspecting the exchange, etc.

* * *

NEW YORK INDEPENDENT TELEPHONE ASSOCIATION.

At a meeting of the executive committee of the New York State Independent Telephone Association, held last October, it was decided to divide the state into twelve districts, each district to have its own organization and to meet at least four times during the year. These districts, together with the territory included in each and their respective temporary chairmen, are as follows:

Buffalo.—Erie, Wyoming, Niagara, Orleans and Genesee counties. H. H. Persons, chairman.

Rochester.—Monroe, Livingston, Ontario, Wayne, Orleans and Yates. George R. Fuller, chairman.

Jamestown.—Chautauqua and Cattaraugus counties. T. S. Lane, chairman.

Elmira.—Chemung, Tioga, Tompkins and Seneca counties. George N. Orcutt, chairman.

Syracuse.—Cayuga, Oswego, Onondaga and Madison counties. F. M. Potter, Jr., chairman.

Hornellsville.—Allegany, Steuben and Schuyler counties. George N. Orcutt, chairman.

Binghamton.—Broome, Chenango, Cortland and Delaware counties. George B. Wright, chairman.

Utica.—Oneida, Herkimer and Otsego counties. T. Harvey Ferris, chairman.

Watertown.—Jefferson, St. Lawrence, Lewis, Franklin counties. C. D. Warner, chairman.

Troy.—Saratoga, Clinton, Essex, Warren, Washington and Rensselaer. W. L. Burke, chairman.

Albany.—Fulton, Hamilton, Schenectady, Montgomery, Schoharie, Albany, Greene and Columbia counties. Howard Hendrickson, chairman.

Poughkeepsie.—Dutchess, Ulster, Sullivan, Orange, Putnam, Rockland, Westchester, Manhattan and Long Island. John H. Schofield, chairman.

Of these districts, Rochester, Buffalo and Jamestown held their first meetings on February 3, 4 and 5, respectively. At the meeting of the Rochester district, which was held in Rochester, reports were made of the rapid growth and financial success of the Independent companies operating in the district, and much enthusiasm was shown in the proceedings.

Twenty-seven of the thirty incorporated companies operating in the district were represented at the meeting and reports were made for the following companies:

Brockport Telephone Company, Dr. F. A. Winne; Charlotte Telephone Company, F. E. Mahan; Clifton Springs Telephone Company, J. T. Belanger; Crosby-Barrington Telephone Company, C. E. Guilo; Fairport Telephone Company, F. Best; Geneva Telephone Company, F. S. Bronson; Holley Telephone Company, J. J. Clark; Home Telephone Company of Albion, Garrison Babcock; Inter Lake Telephone Company, W. J. Kibbe; Inter Ocean Telephone & Telegraph Company, T. S. Lane; Lakeside Telephone Company, H. J. Tuttle; Livingston County Telephone Company, M. J. Murphy; Milo Telephone Company, J. J. Gardner; Newark Telephone Company, W. H. Kelly; People's Telephone Company, H. W. Blake; Pittsford Telephone Company, A. A. Williams; Penn Yan Telephone Company, Elmer Lahrm; Rochester Telephone Company, G. R. Fuller; Seneca-Gorham Telephone Company, Rice McCauley; Torrey Telephone Company, F. E. Spencer; Naples Telephone Company, Hector Blake; Wayne-Dundee Telephone Company, S. I. Thayer.

It was reported that nearly 20,000 Independent telephones are in operation in the Rochester district and that extensive building of new lines is planned everywhere.

Officers were elected for the ensuing year as follows: Chairman, George R. Fuller, Rochester; vice-chairman, H. W. Blake, Naples; secretary, F. S. Bronson, Geneva.

The next regular meeting of the Rochester district will be held May 4 at a point in the district to be hereafter determined.

Meetings of the other districts—eleven in all—which constitute the New York State Independent Telephone Association, will be held soon.

The Buffalo meeting was held at the offices of the Consolidated Telephone Company, in the Ellicott Square building. The reports from the companies represented were of a most gratifying character, showing that business had increased wonderfully in the last few months, the outlook for the coming year being encouraging in the extreme. The experiences of the delegates proved of great value, pertaining to nearly every phase of the industry. R. Max Eaton, manager of the Niagara County Telephone Company, drew attention to the desirability of apparatus which would show a lower percentage of depreciation than existing types. By way of illustration he pointed out the shortcomings of wooden-cased telephones. These, shortly after installation, become marred from various causes, becoming practically dead wood on the hands of the company after being taken out. Mr. Eaton suggested the substitution of metal for wood in all cases, and stated that his company intended to use a type of metallic case, heavily enameled. This departure in design would enable the apparatus to be kept in good order and after being returned to the store room could be reissued without the necessity of any great expenditure in refinishing. Mr. Eaton also drew attention to the requirement of the Board of Fire Underwriters in regard to lightning protection; at the present time only four types have been approved by the National board. Protection is a very important part of the installation at a sub-station, and, in view of the fire underwriters' rulings, it should be carefully considered.

H. H. Parsons presided as chairman of the meeting, and T. S. Lane acted as secretary. At its conclusion it was unanimously decided to hold the next meeting in Buffalo, Friday, May 5.

The New York state association will meet once a year, and will be made up of delegates from the district associations. The next meeting will be at Albany in June of the present year.

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KANSAS INDEPENDENT TELEPHONE ASSOCIATION.

More than 100 members of the Kansas Independent Telephone Association gathered at Topeka, February 8 and 9, the occasion being the fourth annual convention of that organization, and it was unanimously agreed by all present that it was, in every particular, the most successful meeting ever held by that association. Convention headquarters were at Hotel Throop, where nearly one entire floor was given over to exhibits of apparatus by manufacturers and supply men. The programme as arranged was carried out to the letter, except in one instance, where, in the absence of Theodore Gary of Missouri, his paper was read by his son. The papers all showed careful preparation and were highly instructive, while the discussions were freely participated in and awakened a high degree of interest.

The address of welcome, delivered by Governor E. W. Hoch, was one of the happiest features of the convention. He said in part:

I drop the cares of office, gentlemen, to come to you simply, in an unpremeditated and unprepared manner, and address you a word of welcome. It is a relief, let me say, to get away for a moment from the horde of people who say "just a minute," and then keep you half an hour or an hour.

Among all the achievements of human ingenuity in the way of modern invention, it seems to me that none has been more remarkable than the invention of the telephone. Why, you and I have not been used to the telephone but a little while, and we would not know how to do without it now. Of course, it has come to stay. It will be extended until soon every farmer will be able to be in touch with the city and town. It is a great commercial convenience and a great business interest.

I know something of the struggle which this particular association has had to engage in to reach its present condition of prosperity and success. You have battled against great forces under great difficulties, and I am glad to learn your association is on a sound basis and in a prosperous condition, and that the future of it is assured. But I am glad to be with you. I congratulate you upon the success of your association. I wish you every good, every possible good that can come to the association in the way of business, in the way of success, and I thank you for the privilege of coming and speaking to you these heartfelt words, these sincere words of congratulation and of welcome.

In the afternoon the association discussed the question as to whether it would ask the legislature for something in the way of preventing people who moved houses from cutting telephone lines. After a long discussion the members decided that there were enough laws on the statute books, if properly enforced, to give the telephone companies of the state all the protection needed. One of the members said: "We want to keep out of the legislature. If we go there asking for laws we will simply stir up trouble. We can do our business without special legislation." This is the first state association which has held a meeting in Topeka during the legislature which has not asked for some legislation.

The programme in full follows:

WEDNESDAY, FEBRUARY 8.

MORNING SESSION.

9:00—Registration and Introduction of Delegates.
10:30—Convention Called to Order.
Welcome by Hon. E. W. Hoch, Governor of Kansas.
Response—President A. A. Godard.
11:00—President's Address.
Minutes of Previous Meeting.
Reports of Treasurer and Secretary.
Appointment of Committees.
Payment of Dues.
Applications for Membership.
11:45—Recess for Luncheon.

AFTERNOON SESSION.

2:00—Reports of Committees.
2:30—"What of the House Mover?"—J. M. Doyle.
Other Needed Legislation.
Discussion.
4:00—"Effect of Mutual Farm Lines on Local Toll Business"—J. A. Zimmerman.
4:30—Discussion.
5:00—Adjournment.
8:30—Smoker—Throop Dining Hall.

THURSDAY, FEBRUARY 9.

MORNING SESSION.

10:00—"Toll Line Accounting"—C. L. Brown.
Discussion.
10:30—"Toll Rates and Divisions."
"Uniform Joint Rates."
Discussion.

11:00—"The Kansas City Home Telephone Company"—O. C. Snider.
11:30—"The Consolidated National-Interstate Association"—Theodore Gary.
Noon Recess.

AFTERNOON SESSION.

2:00—"Development and Operation of the Wichita Exchange"—H. D. McVey.
2:30—"Supply Dealers, Manufacturers and Us"—W. H. Nelson.
3:00—"Territorial Contracts."
"Sub-license Contracts."
"Constitution and By-Laws."
"Good of the Order."
Discussion.
4:30—Election of Officers.
Our Next Meeting.
Resolutions.
Adjournment.

In the place of a banquet a smoker was held in the dining room of Hotel Throop Wednesday evening. There were several informal talks make by delegates and exhibitors, in addition to a fund of clever stories being turned loose, all in all furnishing an evening of jolly entertainment.

Following is a list of the officers elected for the ensuing year:

President, A. A. Godard, Topeka; vice-president, J. M. Doyle, Belleville; secretary, E. C. Walls, Marion. Executive committee: J. E. Byers, Ottawa; M. L. Robinson, Galena; C. E. Pearl, Hiawatha; W. H. Nelson, Smith Center.

* * *

INDEPENDENTS MEET AT PENN YAN.

More than a score of delegates from recently organized telephone companies at Oaks Corners, Port Byron and Weedsport, New York, assembled in Penn Yan, New York, recently, the object of their visit being the inspection of the several Independent telephone lines that have been developed in Penn Yan and vicinity under the supervision of A. M. Taylor. Among those who assisted in the entertainment of the visiting delegates were the officers of several of the Independent telephone companies connected with the Penn Yan Telephone Company. The following companies were represented: Branchport, Keuka Park and Pulteney; Milo Telephone Company; Torrey, Dundee, Friend, Crosby-Barrington.

A banquet was tendered the visiting delegates at the New Knapp House, after which an informal discussion was held by the several officers of the various telephone companies and by the representatives of the visiting companies. The persons who were instrumental in forming local companies in the vicinity of Penn Yan explained at some length the method of financing, maintenance and cost of line, and advised the visiting delegates that the co-operative or mutual plan of operation and construction of Independent lines for the purpose of getting service at a low cost was feasible, and has been ascertained to be self-supporting in all the local companies formed in the vicinity of Penn Yan.

The question of long-distance connections available to the Independent companies was discussed. General Manager T. S. Lane of the Inter-Ocean Telephone Company addressed the meeting regarding the long-distance connections made possible by his company.

The visiting delegates expressed themselves as pleased with the results secured by the Independent telephone lines in Penn Yan and the adjacent territory, and it was voted to push the work of completion of the Independent telephone lines in the vicinity of Oaks Corners, Port Byron, Weedsport and adjoining territory with the utmost dispatch.

* * *

TRI-STATE INDEPENDENT TELEPHONE ASSOCIATION.

The Tri-State Independent Telephone Association held a well attended and enthusiastic meeting at Westville, Indian Territory, recently, at which the chief subject of discussion was toll lines. An excellent address was delivered by H. E. Scovern, manager of the Home Telephone Company of Joplin, Missouri, his theme being "The Value of Toll Lines."

Among the telephone men present were: H. E. Scovern, manager Home Telephone Company, Joplin, Missouri; H. C. Slaughter and Mr. Berry, North Arkansas Telephone Company, Fayetteville, Arkansas; J. I. Potter and D. M. Bostwick, Potter Telephone Company, Gravette, Arkansas; W. T. Stehl, Siloam Springs, Arkansas, Telephone Company; M. M. Collier, Prairie Grove Telephone Company; J. L. Lauderman, Pann Telephone Company, Fort Smith, Arkansas; A. R. Carroll, Cane Hill Telephone Company; W. D. Wasson, Wasson Telephone Company, Gentry, Arkansas; K. G. Comfort and T. A. Cales, Westville (I. T.) Telephone Company.

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OKLAHOMA INDEPENDENT TELEPHONE ASSOCIATION.

The annual meeting of the Oklahoma Independent Telephone Association was held in El Reno, at the Kerfoot Hotel, on Thursday, February 23. There was a good attendance and much enthusiasm was shown by those present. The questions that were most thoroughly discussed were the farmers' line, the party line and tolls. A more complete report of the convention will appear in the April number of TELEPHONY.

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MICHIGAN INDEPENDENT TELEPHONE ASSOCIATION.

One of the most important recent Independent conventions was that held by the Michigan Independent Telephone Association at Battle Creek, Thursday and Friday, February 23 and 24, the convention headquarters being at the Post Tavern. The gathering was the most successful ever held by the Wolverine Independents, 200 delegates being present, besides a large number of representatives from leading telephone manufacturing and supply houses, and kindred industries, nearly all of whom made exhibits. The programme was an excellent one, a number of highly interesting and instructive papers being read, which awakened lively and profitable discussion. It follows in full:

THURSDAY, FEBRUARY 23.

AFTERNOON SESSION.

2:30—Addresses of Welcome, Mayor Clarence W. Clapp, John J. Gibson, president Business Men's Association.
2:45—President's Address, E. B. Fisher, Grand Rapids.
3:00—"Our Friend, the Farmer," N. F. Wing, Grass Lake.
4:00—"Progress of the Clearing House," W. S. Vivian, Grand Rapids.
4:45—"Our Contract Relations," Hon. W. J. Stewart, Grand Rapids.
5:30—"Care and Maintenance of Equipment," Edmond Land, Grand Rapids.
6:00—"Experience of Managers," F. C. Hughes, Lansing.
8:00—Banquet at Battle Creek Sanitarium.

FRIDAY, FEBRUARY 24.

MORNING SESSION.

9:00—"Value of Organization," J. B. Ware, Saginaw.
9:45—Paper, J. G. Hoge, Cleveland, president of the National Interstate Telephone Association.
10:30—"Tactics of the Opposition," Stanley C. Parkhill, Mayor of Owosso.
11:45—"Toll Service," F. B. Newman, Grand Rapids.

AFTERNOON SESSION.

2:15—"General Bookkeeping," R. F. Johnson, Saginaw.
3:00—"Toll Service Errors," W. J. Melchers, Alma.
3:45—"Development and Prospects in Southern Michigan," A. B. Himebaugh, Colon.
4:00—"Quality in Equipment," C. B. King, Ann Arbor.
4:15—Election of Officers.

In the March number of this paper will appear a full account of the meeting.

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ANNUAL MEETING OF ORANGE AND SUSSEX ASSOCIATION.

The Orange and Sussex Independent Telephone Association held its annual meeting in Middletown, New York, nearly all of the companies of the association being represented. Those present were: Hon. M. N. Kane, George H. Strong and George F. Ketchum, Warwick; W. D. Haggerty, Sussex; George G. Otis, Newburgh; Dr. Miller, Newton; M. C. Tuthill, Henry Greenfield and G. H. Tuthill, Wash-

ingtonville; George R. Conkling, Monroe; J. I. Brink and R. S. Coursen, Coleville; A. B. Wilbur, Charles Higham and W. C. Ramsdell, Middletown; G. M. Roe, T. F. Lawrence and F. L. Conkling, Chester.

The following officers were elected: President, George G. Otis, Newburgh; vice-president, George F. Ketchum, Warwick; treasurer, W. D. Haggerty, Sussex; secretary, M. C. Tuthill, Washingtonville.

New by-laws providing that a company entering into a compact with the Bell Telephone Company cannot longer be a member of the Independent association were presented and adopted. After the reading of the by-laws, President Charles Higham and A. B. Wilbur of the Orange County Telephone Company, withdrew from the meeting.

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OHIO CONVENTION IN MARCH.

The annual convention of the Ohio Independent Telephone Association will be held in Columbus on March 30. The executive committee of the association recently met at Columbus and arranged the date. A highly interesting programme is being prepared and it is expected to make this the banner meeting in the history of the association. One of the subjects to come up for general discussion will be that of means of developing the Independent telephone business of Ohio to a still higher standard. As is well known, Ohio is better organized by the Independents than any other state in the Union and the other states are looking to Ohio for action. Frank L. Beam of Columbus is president of the association and James B. Hoge of Cleveland, president of the National association, is one of the vice-presidents.

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IOWA INDEPENDENT TELEPHONE ASSOCIATION.

What promises to be the largest meeting of Independent telephone men ever held in the state of Iowa will take place in Des Moines March 14, 15 and 16, when the seventh annual convention of the Iowa Independent Telephone Association will be held. Exhibitors from all over the country will be present, the entire fourth floor of the Chamberlain hotel being reserved for their displays. The headquarters of the association will be at the Chamberlain. The association banquet will be held Wednesday evening, March 15.

Iowa has more Independent telephone companies than any other state in the Union. This is said to be due to the prosperous farming communities and the general use of telephones by the farmers. No other state in the Union has as many rural lines.

The officers of the state association are: President, J. C. Sullivan, Chariton; vice-president, S. S. Lichty, Vinton; secretary and treasurer, C. C. Deering, Boone. George N. Bandy of Des Moines and C. C. Deering, formerly of Des Moines, but now of Boone, are the programme committee.

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MINOR MEETING AT VILLISCA, IOWA.

A convention of the operators, linemen and boards of management of the numerous farmers' mutual telephone companies in the vicinity of Villisca and Hepburn, Iowa, was held at Villisca February 15, at which the following central offices were represented: Blanchard, Coin, Yorktown, Norwich, College Springs, Elmo and Clearmont, Missouri; Bradyville, Shambaugh, Clarinda, Hawleyville, New Market, Bedford, Gravity, Guss, Henshaw, Nodaway, Grant, Stanton, Nyman, Essex, Bethesda and Hepburn. The citizens of Villisca entertained the visitors with a banquet.

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NORTHEASTERN IOWA INDEPENDENTS MEET.

About fifty managers and owners of Independent telephone lines in northeastern Iowa attended the quarterly meeting of the Northeastern Iowa Independent Telephone Association at Waterloo, Iowa, February 14, which was held in the parlors of the Irving hotel. Beside Iowa men, several from other states, as far away as New York, were present. Among the subjects discussed were the following:

"Improving Our Toll Service in the Office," W. G. Norman, Dubuque.

"Advertising Toll Service by Independents," F. E. Outing, Center Point.

"What Can We Do to Improve the Financial Standing of Independent Telephone Securities?" W. F. Broeksmit, Iowa Falls.

"What Can We as Individuals Do to Increase the Interest and Attendance at Our Meetings?" S. J. Elgin, Monticello.

"What Is New in the Telephone Business?" V. H. Stevens, Dubuque.

AUTOMATIC TELEPHONE FIRE ALARM.

Patents have been recently granted to W. L. Denio of Rochester, New York, on a telephone fire alarm system. This device secures its energy from the central office, so that there is no local battery to get out of order. It consists of one or more signal boxes installed in any building having a telephone. One signal box is sufficient for ordinary purposes, but if one box is placed on each floor, a fire starting on that floor would send a signal through that box, which would indicate that particular floor, so that no time would be lost by the fire department in locating the exact seat of the conflagration.

Leading from the signal box is a circuit on which glass-protected push buttons are located at convenient points, also thermostats on the ceiling. This signal box consists essentially of an electro-magnet arranged to be energized by the closing of the circuit by a thermostat or push button, which magnet unlocks a vibrating pendulum driven by an escapement wheel and a spring, operating to send in the signal indicating the floor on which the fire occurs. For instance, the wheel in the signal box on the fourth floor would be four points, one on the fifth floor five points, and so on.

The signal box is so constructed that the signal will be repeated a sufficient number of times to insure the central exchange operator getting it correct. The star-pointed wheel causes the central exchange light to flicker, and it cannot be mistaken for anything else, because the operator is able to hear the mechanism of the box. The sound is very positive and distinct, and cannot be misunderstood. Provision is made for breaking the circuit through the alarm apparatus, after the alarm has been sent in, so that there is no interference with the use of the telephone. The thermostats are so constructed that the moment they are subjected to 125 deg. of heat they collapse and close the circuit, thus sending in the signal.

It makes no difference whether the telephone line happens to be busy or the receiver has been carelessly left off the hook, the alarm takes precedence, automatically cutting out everything else until it has gone in and automatically placing the telephone in use again. When the operator at the central exchange receives a signal, she notifies a special operator in charge of the fire calls, who in turn sends the alarm to fire headquarters, being able from her list of subscribers to tell the exact location of the fire. In the meantime the first operator rings the telephone bell in the office or building from which the alarm came, thus notifying the person who had sent in the alarm that it had been received and the fire department is on the way; or in the event of an alarm having come from a distant part of the building, a man sitting in his office might be thus warned by the telephone operator that there was a fire in his building, which he had not discovered.

Mr. Denio's patented thermostat and push button circuit is such that it could almost entirely be destroyed and still the alarm will go in just the same.

Bankers Buying Up Independent Securities

WILLIAM GLENDENIN

IN the preliminary survey of the financial phase of Independent telephony, published in the February issue of this journal, no attempt was made to state specifically the investment facts of more than two or three typical cases. In this article it is the intention to extend the discussion in detail; to call the witnesses, so to speak, and adduce some portion of the mass of sworn statements and dividend declarations which are coming in in behalf of the general cause. Beyond that we shall set out some few of these cases in full, and we have for this a good and sufficient reason. That reason is the avowed and evident policy of the trust and its votaries to suppress and conceal the true condition of Independent properties and to distort and grossly misrepresent the proportions and rates of operating expenses to receipts, both gross and net.

In the absence of such wholesome and legitimate publicity it is not to be wondered at that many otherwise well informed bankers and investment authorities should have been hoodwinked by trust agents and deliberately blinded to the profit that lies in 99 per cent of these properties—a profit more certain, more general and more uniform than that of the institution of banking itself. This amazing comparison has been suppressed by the trust for reasons that are obvious; any representation which tends to prevent investment in Independent securities and withhold the capital which under natural conditions would flow to its support, prevents or postpones the establishment of new Independent exchanges to just that degree, or compels the exploiting company to seek capital from the public at large.

In other words, the trust has all along been in the situation of the monkey with a full stomach, who holds the nuts in his cheek, unable to swallow them himself and unwilling to disgorge for the benefit of anyone else. This wily Machiavellian policy has prevailed with varying success for years. Recent developments indicate a change of view; the banker is being reached by the independent press and the statistics of the government Department of Commerce and Labor and the wide discussion of the subject by impartial financial journals and telephone publications has turned the limelight of illumination in the other direction.

The result is an unusual activity in demand for Independent bonds and stocks among leading banks, both national and private, trust companies and investment corporations generally. For instance, in Wisconsin last month the Wisconsin Fidelity, Trust and Safe Deposit Company, acting for the Badger State Telephone and Telegraph Company, was given a $500,000 mortgage covering an entire issue of 1,000 $500 bonds, bearing interest at 5 per cent.

In Missouri, President Elliott of the People's Savings Bank of Chillicothe, has purchased for personal investment account an entire one-half interest in the Chillicothe Telephone Company (Independent).

New York and Cleveland capitalists have concluded a loan of $450,000 for improvements and extension of the equipment of the Federal Telephone Company of Cleveland. This same corporation recently reduced its liabilities by $600,000.

Toledo capitalists recently made heavy profits in the Utica-Rome Independent telephone transaction. Toledo and Louisville telephone securities have advanced 15 points in as many weeks.

In Chicago, the Inter-State Telephone Company, with an authorized bonded indebtedness of $50,000,000 and a capital stock of $3,000,000, is represented by no less a financial institution than the American Trust and Savings Bank. This great volume of bond and stock issue, it is expressly stipulated in the trust deed held by the bank named, shall bear dividends payable only out of the net earnings of the company. The bonds of the Northwestern Telephone Company of $500,000 ($407,000 authenticated) were assumed by the Inter-State Company and retired by the issuance of its own bonds in lieu thereof. The organization of the Inter-State Company and its stock and bond issues have received the endorsement and approval of the most eminent corporation counsel of Chicago, and the trust deed and the securities issued under it have been so drawn as to qualify for listing under the requirements of the New York Stock Exchange; which, in turn, entitles the securities to list privileges on any stock exchange in the world.

These are the transactions of the last current month so far reported. What must have been the financial support in hundreds of other cases, may be conjectured from the following *dividend reports* received from Independent companies throughout the country. We cannot publish the entire list in this issue. Those given are taken from sections in all parts of the country; they are not selected cases from peculiarly fortunate localities, but from the whole Independent field of the United States:

Home Telephone Company, Finley, Nebraska—dividend, 10 per cent.

Central State Telephone Company, Oberlin, Kansas—regular 3 per cent quarterly dividend, 12 per cent per annum.

Lake Shore Telephone Company, Michigan, has just issued its regular 2 per cent quarterly dividend.

Iron Range Telephone Company, northern Minnesota, semi-annual dividend of 9.6 per cent.

Three Rivers (Mich.) Telephone Company—6 per cent dividend declared.

Crawford County Telephone Company, Denison, Iowa—10 per cent dividend.

Inter-State Telephone Company, Aurora, Illinois—*thirteenth regular quarterly* dividend.

Home Telephone Company, Utica, New York—7 per cent dividend.

Park Telephone Company, Round Lake, New York—8 per cent dividend.

Pomona Valley (Cal.) Telephone and Telegraph Company—*semi-annual* dividend of 8 per cent, or 16 per cent per annum.

Inter-State Telephone Company, Dubuque, Iowa—dividend of 12 per cent.

Northwestern Ohio Telephone Toll Line Company—dividend of 5 per cent; stock at 40 per cent face value; face rate dividend, per share, 11 per cent.

Union Telephone Company, Alma, Michigan—semi-annual dividend, 4 per cent.

Twin City Telephone Company, Minneapolis—semi-annual dividend of 5 per cent; 10 per cent per annum.

Shelby (Iowa) Independent Telephone Company—dividend of 8 per cent.

Marquette County (Mich.) Telephone Company—dividend of 10 per cent.

Stewart (Ga.) Telephone Company—dividend of 20 per cent.

Red River Valley Telephone Company—dividend of 12 per cent.

Indianapolis Long-Distance Telephone Company—4 per cent; face rate dividend of 8 per cent.

Belmont Telephone Company, Bridgeport, Ohio—dividend of 33 1/3 per cent.

Grand Rapids (Mich.) Citizens' Telephone Company—*thirteenth consecutive quarterly dividend* of 2 per cent—annual total dividend, 8 per cent.

The import of this showing is that Independent securities *do pay* dividends, and not a few of them *greater dividends than the trust or its constituent companies ever paid!*

The reaction in financial circles when the full force of these facts is felt will redound to the advantage of the Independent movement in all its ramifications, for once lodge the conviction that Independent securities *as a class* are money-makers and the tide of absorption will set in in a way that will open up a market for them, which will prove not only receptive, but competitive in its eagerness to buy.

It is the history of all general financial movements in the absorption of utility securities that the period of publicity and education must be passed before the conservatism of capital can be overcome. That the banking fraternity has seen a great light in the past few months and is now approaching the waiting market of the Independents is an open secret. It is a short step from interested scrutiny to investment scramble; and when that comes the hey-dey of the Independents has come, for it brings with it the confidence and comfort of great capital; a closing of the mouth of deceit and a cessation of unfair commercial tactics.

Financial truth, like its analogies in every walk of life, may be blinded, but it will out sooner or later. The value of Independent telephone securities cannot be perpetually concealed from capitalistic estimation, for they have the *positive* virtue of giving an equivalent for their franchise rights, both in service and in dividends. And right here let me quote no less an authority than James H. Eckels, former comptroller of the currency under Cleveland, and now president of the Commercial National Bank of Chicago. Mr. Eckels in a recent masterful article on "Credit" says (and the telephone trust and its counterparts may read as they run and with profit):

"Overweening desire to accumulate riches without giving its equivalent in toil—the receiving of 'something for nothing'—is the one rock—the Scylla—upon which more business careers have been wrecked, more fortunes lost, than any other in the whole wide sea of business experience."

Commercial conservatism, he says, is "that sterling quality which carefully plans the future, counts the cost, weighs the probabilities of success, considers the chances of failure, *rejects the speculative,* limits the hazardous, husbands the resources, makes sure of being *right,* and then goes resolutely on to the accomplishment of well-considered purpose, undaunted by obstacles, undismayed by disappointments, compelling and achieving success through consciousness of innate strength."

And again—and this pertains peculiarly to the statements of *all* telephone corporations, and it marks significantly one of the strongest features characteristic of the Independent companies—Mr. Eckels says:

"Annual detailed statements of affairs should show the status of the business in all essential matters of detail, *disclosing losses and bad debts* where they have been sustained; contingent liabilities; *the ratio of expenses and losses* to *the gross volume of business,* and all similar terms having a bearing."

Now let our banking interests consider the investment value of Independent telephone securities in the light of these rational rules of comparative valuation. Let us apply them to an examination of three or four annual reports of leading Independent telephone companies, for the year 1904, just received, and in remarkable accord with Mr. Eckels' views of accurate calculation. Let us go west for the first one. The Home Telephone and Telegraph Company of Los Angeles, California, in its annual stockholders' report for 1904 covers in detail the quarterly earnings for its entire first year's business. After enumerating its extensions the report says that because of the increased number of telephones installed the earnings should be even greater than shown in the statement submitted:

Earnings for first quarter, ending December 31, 1903	$67,633.71
Operating expenses, taxes, insurance, maintenance and interest on bonds	45,274.10
Available for dividends, improvements or surplus	$22,359.61
Dividends paid January 10, 1904	17,330.00
Surplus	$ 5,029.61
Earnings for second quarter, ending April 1, 1904	$79,698.59
Operating expenses, taxes, insurance, maintenance and interest on bonds	47,881.08
Net earnings for quarter	$31,817.51
Surplus from last quarter	5,029.61
Available for dividends, improvements or surplus	$36,847.12
Dividends paid April 10, 1904	18,980.00
Surplus	$17,867.12
Earnings for third quarter, ending July 1, 1904	$86,944.39
Operating expenses, taxes, insurance, maintenance and interest on bonds	50,469.46
Net earnings for quarter	$36,474.93
Surplus from last quarter	17,867.12
Available for dividends, improvements or surplus	$54,342.05
Dividends paid July 10, 1904	20,080.00
Surplus	$34,262.05
Earnings for fourth quarter, ending October 1, 1904	$89,867.22
Operating expenses, taxes, insurance, maintenance and interest on bonds	51,946.00
Net earnings for quarter	$37,921.22
Surplus from last quarter	34,262.05
Available for dividends, improvements or surplus	$72,183.27
Dividends payable November 10, 1904	21,580.00
To surplus	$50,603.27

The reader will not fail to note that the dividends *paid* by this company are stated quarterly, thus: January 10, 1904, $17,330; April 10, 1904, $18,980; July 10, 1904, $20,080; November 10, 1904, $21,580—a total annual dividend of $77,970. Also that the net dividend by quarters was a steady proportionate increase in each quarter, from $17,330 in the first quarter to $21,580 in the concluding quarter of the year, with a grand disbursement total of $77,970 for the first and most expensive year of the company's life.

The annual statement of the Home Telephone Company of Elkhart County, Elkhart, Indiana, discloses a very similar and gratifying condition. Comparative statement for the quarters shows:

For the quarter ending March 31, 1904:	
Total revenue	$9,122.93
Total expenses	3,798.54
Net earnings	$5,324.39
Quarterly bond interest on $150,000 (5 per cent)	1,875.00
Profit	$3,449.39
For the quarter ending June 30, 1904:	
Total revenue	$9,610.48
Total expense	3,831.00
Net earnings	$5,779.48
Bond interest (as above)	1,875.00
Profits	$3,904.48

For the quarter ending September 30, 1904:	
Total revenue	$9,391.91
Total expense	4,362.16
Net earnings	$5,029.75
Bond interest	1,875.00
Profit	$3,154.75
For the quarter ending December 31, 1904:	
Total revenue	$9,450.53
Total expense	4,727.72
Net earnings	$4,722.81
Bond interest	1,875.00
Profit	$2,847.81
Analyzed, this report shows:	
Total earnings for the year	$37,585.85
Total expenses	20,952.75
Bond interest	6,335.00
	$27,287.75
Total profits for the year	$10,289.73

And during this period there was expended for construction the sum of $18,798.10. Gross earnings per telephone were $17.64; net earnings per telephone, $4.92; total number of telephones, 2,128; net increase in telephones for the year, 399. The capital stock of this company is $137,-110.

The Twin City Telephone Company, Minneapolis and St. Paul, reports: Capital stock, $1,500,000; bonds, $1,-100,000; regular annual dividend, 7 per cent.

Rochester Home Telephone Company, Rochester, New York: Capital stock, $600,000; bonds, $400,000; pays 6 per cent on preferred, 5 per cent on common stock.

Citizens' Telephone Company, Grand Rapids, Michigan: Capital stock, $1,185,000. Has paid 8 per cent dividends regularly for the past six years.

The Home Telephone Company of South Bend, Indiana, has paid 6 per cent on its bonds annually ever since the organization several years ago, in addition to the stock dividends.

The Cuyahoga Telephone Company of Cleveland (which has been viciously maligned by the trust) reports the last quarter of 1904 the most prosperous of its five years' history, with an increase in annual earnings of $106,410.50, with a surplus for the year of $63,524.

Here let us refer again to the rule laid down by Mr. Eckels—"the ratio of expenses to the gross volume of business." Col. Frederick S. Dickson, president and general manager of the Cuyahoga Telephone Company, says: "I am sorry for the sake of the Bell people that I *cannot expend* 60 per cent of my earnings for my expenses, as they insist I should. The percentage was a little less than 51 1-3 per cent. * * * and *Cuyahoga rates are cheaper than Bell rates, and the service is better than the Bell service.*"

It will be observed that in every instance where our space has permitted of elaboration of the statements quoted that the governing rule of ratio laid down has been painstakingly adhered to by the officials of the companies making the report, and they have done this of their own free will and accord in the natural proper presentment of the respective cases *in advance of Mr. Eckels' injunction,* which was published in Chicago February 1.

Were anything wanting to display the business-like methods and correct financiering of Independent companies, this unconscious anticipation of new standards must convince any impartial critic of the integrity and sterling character of these securities as investment depositories.

Another element of vital importance in considering bank standing of Independent stocks and bonds is the full measure of *all* stocks and bonds, or the full normal standard of that measure as "constituting good banking security." And every banker knows that to decide this question he must revert to the broad principles which govern all banking transactions and apply those principles to the case in issue. Those principles in turn involve consideration of the character of the funds which bankers employ, and the conditions on which they hold them. The actual capital possessed by a banker generally forms but a very small portion of the funds which he has at his disposal, the employment of which, for the time being, constitutes the main source of his profit.

The real business of a banker is to borrow from one class of customers and lend to another—to offer to the public a safe place of deposit from day to day for their money, and at the same time rendering such a portion of the whole aggregate of these deposits available to the *community* as temporary advances, or loans, as is consistent with the obligations for repayment. Therefore, while real property as such, is not admissible as banking security, stocks and bonds issued by Independent telephone corporations holding such real property as part assets are, the franchise and public utility and patronage constituting the basic value of such issues.

The *Bankers' Magazine* in a liberal discussion of utility bonds, railroad bonds and debentures as proper banking securities says: "As objects of investment they are open to all the *un*objections we have stated."

Securities of this nature—and the classification is acknowledged to include the listing of Independent telephone securities—is coupled by this national banking authority with the most approved form of gilt-edge collateral—warehouse receipts and consols. Independent securities, unlike the Bell, or American Telephone and Telegraph Company securities, partake in their nature of public collateral, for the reason that the utility itself is one *by* the people, *for* the people, and, what is greatly more to the point, *of* the people.

Nowhere in the whole field of financial investment can public confidence be found so securely and solidly at the foundation of the whole fabric as in Independent telephone issues, and, says the *Bankers' Magazine:*

"It is this element which lies at the base of financial investment, *standing,* character and integrity."

On the legal side the warrants and implied warrants of Independent securities, both stocks and bonds and the negotiable effect on the investments themselves, is thoroughly well established. Further in this connection the jurisprudence of the subject has been tried out in twenty years of litigation, which may be said to have established the law and its principles which apply to the legal issue, funding and refunding of such securities.

And now let me call particular attention to another phase of these Independent bonds and stocks which in well-informed financial circles constitutes their peculiar superiority as investment depositories, namely, their immunity from trust contamination and the *fact* that trust abuses have had the unexpected effect of saving the Independent companies from the temptations of overvaluation and artificial inflation, which has afflicted almost every other kind and character of stock and bond issue on the market, *but which the activity of the trust in centering public attention upon Independent affairs has made absolutely impossible.* The trust, in other words, has taught the public by its own short-sighted policy of villification that Independent securities are fairly based, good, substantial, dividend paying and readily convertible securities of the very highest value.

"There is nothing illusive, hypnotic or phantom-like about honest securities," says a leading authority; "no jugglery to conceal the real value of what does duty for collaterial in bank loans. The great mass of Independent companies are small companies, neither shadowy nor showy, but plain, honest, old-fashioned money-makers of the get-at-able, wholesome sort.

An Important Decision

WE publish herewith a copy of Judge Seaman's decision in the case of the Western Electric Company vs. the Galesburg Union Telephone Company. The decision is an important one, because the patent itself is an alleged pioneer patent in the matter of common battery automatic signaling switchboards. The counsel for complainant were George F. Barton and Edward Rector; counsel for defendants, Charles A. Brown.

The decision in full follows:

CIRCUIT COURT OF THE UNITED STATES, NORTHERN DISTRICT OF ILLINOIS, SOUTHERN DIVISION.

Western Electric Company, Complainant, vs. Galesburg Union Telephone Company and Howard Knowles, Defendants. In Equity Patent No 669,708. On Final Hearing.

This bill is for alleged infringement of Letters Patent No. 669,708, issued March 12, 1901 (on application filed February 28, 1895) to Charles E. Scribner, for "Apparatus for Telephone Switchboards." The complainant is the owner of this patent and manufactures and installs telephone switchboards, and has the invention in question embodied in several exchanges. The defendant, Galesburg Union Telephone Company, is a local exchange at Galesburg, Illinois, and employs a form of signaling apparatus which is alleged to embody the patent invention. The specifications of the patent state that the "invention relates to the signaling and testing appliances of telephone switchboards," and then describes the invention in general terms as follows:

"It comprises two co-operative features which concern, respectively, the transmission of signals from the substation of a telephone line to the telephone switchboard and the indication of the free or 'busy' condition of a line to an operator making connection with it. The objects of the first mentioned features are to effect the transmission of the signals for connection and disconnection at the telephone switchboard automatically in the use of the substation apparatus and to efface the call signal and substitute for this signaling instrument a different signaling device adapted to respond to the signal for disconnection. The object of the second feature is to indicate automatically to an operator establishing connection with a line at any section of the switchboard whether the line be free for use or not, in order that she may not interfere with a connection already existing."

The patent as issued contains seventeen claims, but infringement is predicated on four of these claims, the sixth, seventh, eighth and eleventh, reading as follows:

"6. The combination with a telephone line, of a relay responding to currents in the line, a local circuit including a source of current, a resistance coil, and a line signal lamp, controlled by the relay, the line signal being associated with a spring jack of the line, a connecting plug for the use with the spring jack, a clearing-out signal lamp associated with the connecting plug, and switch contacts adapted to close a shunt circuit through the clearing-out signal lamp about the line signal lamp and the contact points of the relay when the plug is inserted into the spring jack substantially as described."

"7. The combination with a telephone line provided with a switch at the substation for closing the line circuit while the telephone is in use, of a relay and a source of current in the line at the central station, a spring jack connected with the line, a line signal lamp associated with the spring jack, a local circuit controlled by the relay including the line signal lamp, a branch from one terminal of the signal lamp to an insulated contact-piece in the spring jack, a plug for making connection with the line, a conductor terminating in a contact-piece in the plug adapted to register with the said insulated contact-piece in the spring jack, forming the terminal of a conductor including a clearing-out signal lamp and connected with the remaining terminal of the line signal lamp, substantially as described."

"8. In combination, two telephone lines, each terminating in a spring jack and each including a relay and a source of current adapted to respond to current in the line during the use of the substation instruments, a connecting plug in each spring jack, a device in each plug circuit for permitting the transmission of telephonic current therein, but preventing the passage of continuous current from one plug to the other, a line signal associated with the spring jack of each line, and a clearing-out signal associated with each connecting plug, the line signal of one line and the corresponding clearing-out signal being in parallel branches of a local circuit, the conductor including each line signal being controlled by the corresponding line relay, whereby clearing-out signals are substituted for the line signals, and currents in the different lines are caused to give independent signals."

"11. In a testing device for multiple switchboards, the combination with test contacts in the different spring jacks of a line, of a source of current permanently connected through a resistance coil with the rest contacts, a connecting plug and a contact piece therein adapted to register with said test contacts and forming the terminal of a conductor connected with the free pole of said battery, another connecting plug and a similar contact piece therein, a signal lamp in the conductor terminating in the said contact piece, said lamp being adapted to be illuminated by the full current through the resistance coil, whereby the presence of an existing connection is automatically indicated when the last mentioned connecting plug is inserted into the spring jack."

The great invention of the telephone was disclosed to the world within the past thirty years, but the devices for improvement in its use have so multiplied that thousands of patents have issued in this special art. For the development of usefulness in the present day telephone exchange the value of the leading inventions in switchboards and signals cannot be overestimated, and the patents therefor may justly be entitled to liberal construction in so far as they pioneer the way for new and better uses in the new art. The improver, however, cannot be granted monopoly of well known means and uses to bar others from the full benefit of pre-existing art—hence the limitations which must be observed in the construction of patents in so far as the means and uses are within the prior art. Each patent must rest on the character of the invention it discloses, in the light of the art—upon its merits alone—and for its interpretation the court can give no heed to suggestions which were made in this argument upon one and the other side, either of many meritorious inventions by the patentees, or of the alleged monopolistic contract under which the complainant operates.

The patent in suit—No. 669,708, granted March 12, 1901—is one of a series of three patents granted to Scribner, on applications filed respectively in February and July, 1895, all relating to a signaling system for the telephone exchange. The first application resulted in patent No. 548,228, October 22, 1895, and is described in the brief for complainant as "the audible test system." The second, filed the same day as the first, is described as "the visible test system," but was not allowed until March 12, 1901, and is No. 669,708 in controversy. The third application, July 5, 1895 (as thus mentioned), "illustrated and described both systems, and claimed only the combination of the two," and patent issued thereupon as No. 574,006, December 29, 1896. Two other patents for signaling and exchange systems—No. 559,411, issued to Scribner and McBerty, May 5, 1896, on application for February 28, 1895, and No. 559,616, issued to Scribner May 5, 1896, on application filed January 8, 1895—are pertinent references in the briefs, the first mentioned being the patent in issue before Judge Hazel in the so-called "Rochester case." The state of the art in signaling devices is disclosed in other patents in the record.

Three defenses are urged: (1) Want of patentable novelty; (2) double-patenting, on reference to No. 574,006; (3) non-infringement.

The extended and interesting oral arguments and illustrations impressed me with the view that neither of these contentions on behalf of the defendant could be set aside as entirely without force, and that in any aspect of the evidence the scope of invention was narrowed so that infringement could not be found in the defendants' signaling means and system. Since the hearing I have not only read the elaborate printed arguments of counsel and much of the discussion by the experts, but have given particular re-examination as intervals of time have afforded opportunity, to the propositions and authorities discussed in both briefs on behalf of the complainant, and am sure that the various contentions have received consideration. My conclusions, however, will be stated without the extended discussion which an interesting case well presented would seem to justify, if time were available.

1. Upon the first defense of patentable novelty (apart from the question of double patenting), I am satisfied that sufficient invention appears to sustain the patent, though narrow in its scope.

While it is true that Scribner and other inventors had therein furnished supervisory signals in the art which closely approached that of the patent in means and result, none at the date of the application were clear anticipations; and the simplicity of the single relay means and system disclosed by the patentee, as now viewed in the light of the earlier contributions, cannot serve to relegate this useful improvement to the bourne of "merely mechanical skill." Nor do I find the contention of inoperativeness tenable.

2. The second ground of defense is not free from difficulty in its solution under the authorities, but I am of opinion that the patent in suit cannot be upheld under the rule against double patent-

ing, as exemplified in *Miller v. Eagle Manuf. Co.*, 151 U. S. 186,196, and cases there cited. As before mentioned, this singular condition arises out of the division of applications by the inventor and their allowance in reverse order by Patent Office. One application was directed to the "audible test system," and another of like date to the "visible test system," while a third was filed four months later for a purported "combination of the two systems." The last mentioned application for the so-called combination, which described and covered fully the "visible test system" of the patent in suit, resulted in a patent (No. 574,006), which antedates some four years the "visible test" grant in patent No. 669,708. Can the later patent be upheld under such circumstances when the specifications and claims of the earlier patent are fairly analyzed?

The rule against double patenting has long been recognized as inherent in the statutory authority for the grant, so that the invention disclosed by the applicant and embodied in the grant cannot be split up to thus obtain benefits therein beyond a single patent. Difficulty arises in the application of the doctrine both through the divisional methods which have prevailed in the Patent Office and through the various definitions of the test of double-patenting in the reported cases. I have examined the authorities cited in the reply brief of complainant upon this point, and the general line as well, and while the question is interesting, review of their definitions and distinctions when applied to the unmistakable import of these patents is deemed unnecessary As remarked in *Miller v. Eagle Mfg. Co., supra.* (p. 201), "it is not the result, effect or purpose to be accomplished which constitutes invention, or entitles a party to a patent, but the mechanical means or instrumentalities by which the object sought is to be attained." So the means and system embodied in the instant patent are identical with those shown and embodied in No. 574,006, aside from the additional circuit provided in the latter to make the "audible busy test" of the earlier patent. The fact that the specifications of No. 574,006 refer to the prior applications and state that the "present invention" as "effected a combination of these two test systems, making a composite test system which possesses special advantage, and that the patent is termed in the discussion a combination patent, is not determinative. Association of the alleged two test inventions in one is not *per se* another invention, and the name assumed for the system in the application cannot make it a true combination. The means and system of the patent in suit are plainly embodied as an entirety in No. 574,006, with neither elements nor functions modified or changed by the added feature for audible test; and I am constrained to the view that invention therein rests alone on the means for visible test. So considered the invention disclosed is single, not separable, and none of the authorities referred to sanctions a second grant of monopoly.

3. If, however, the foregoing view of the invalidity of the patent is erroneous, I am satisfied that the defense of non-infringement is well asserted, under the interpretation which must be given to the claims of the patent. That signaling and tests in the prior art had progressed to the extent of furnishing both audible and visible tests at the telephone exchange prior to the invention in controversy, and by means closely approaching it, plainly appears.

The broad construction for the system of the patent which is claimed in support of the charge of infringement would bar means and uses which were clearly within the rights of the public when this inventor entered upon the improvement. Of course the claim cannot be thus construed. As before stated the invention is of narrow scope, however beneficial for exchange operation, and must be limited accordingly so that the prior art remains free.

The patent thus described the invention:

"My invention consists in arranging two such signals in parallel branches of a local circuit and in controlling the continuity of one of the branches by a relay responding to currents in the telephone lines. The signal in the branch controlled by the relay is designed to act as an individual signal and is permanently associated with a particular line. The other signal may be associated with one of the plug circuits provided for uniting different telephone lines, and the branch including it may be normally open, terminating in a contact piece in the connecting plug adapted to complete the branch while the plug is in use in a spring jack."

The feature of the structure in which invention is found, in my understanding of it, is the introduction of the resistance coil *m* for its special function in the system—well known in the general art for like effect, but novel in this application for telephone signaling. As described in the brief for complainant, it is "of such character as to limit the flow of current through the circuit, permitting a sufficient amount to flow to illuminate the lamp, but not sufficient to illuminate it if the flow of current be materially reduced." Thus signal lamps identical in kind—supervisory and line—are controlled and reciprocally control each other; when one lamp is alone connected in circuit the current will light it, but when both are connected in parallel both are extinguished as the distributed current is when insufficient to light them—a result being the desirable so-called "visual busy test" of the patent. While the general effect of one lamp on the other was novel, I am satisfied that this feature is absent from and foreign to the defendants' system and structure. While two resistance coils are used therein they have a different function in the system; and the introduction of a resistance means by the patentee exclude other uses of that well known provision in the art. The supervisory lamp is not lighted by the opening of the line lamp circuit, and the lamps do not reciprocally control each other. The means set forth in the patent, which is the sole feature of novelty in the combination, is not thus used, in the defendants' device for the control of the supervisory signal; nor does the defendants' structure furnish the "visual busy test" which is the distinguishing feature of the patent over the prior art. It was well demonstrated at the hearing, if not clear from the nature of the elements, that the supervisory lamp of the defendants' device was not adapted to be lighted by the full current through the resistance there provided and was not so lighted. In other words, the particular function of the patentee's resistance coil is not performed by the resistance used by the defendants, and is not within the purview of its structure or system. The contention that the visual busy test was not only obtainable therein, but was in fact used in the operation of the defendants' exchange is, in my opinion, not established by the testimony introduced to that end, and is inconsistent (for practical purposes) with the demonstrations and recognized principles of the structure.

Other and minor features of difference do not require mention, as the distinctions referred to are deemed sufficient. Analysis of the systems respectively is deemed unnecessary for this summary of my views.

Decree will follow dismissing the bill for want of equity.

(Endorsed.) Filed Feb. 14, 1905. MARSHALL E. SAMPSELL, clerk.

TOLEDO TELEPHONE TRAFFIC.

According to a tabulation just completed by the Home Telephone Company of Toledo, Ohio, 3,573,600 calls were answered by the operators during the month of last November. This would indicate an average of 119,120 calls in a single day, or a telephone call for almost every person residing in the city. One would surmise after contemplating the large number of calls answered in the telephone office that it must require an army of girls to take care of them. But such is not the case. Sixty-four girls are employed by the Toledo Home Company to answer the calls, and it is conservatively averaged that each girl answers thirty calls an hour, or 1,955 calls per day.

The greatest telephone "traffic" occurs between the hours of 10 and 11 o'clock in the morning. This is accounted for by the fact that the average business man reaches his office at 8 o'clock, looks over his morning mail until 9 o'clock and dictates a number of letters for an hour, or a little less, and then he finds time to do a little telephoning. The hour between 9 and 10 o'clock in the morning is also a busy one for telephone operators. Probably the next busiest hour on the telephone is from 2 to 3 in the afternoon. Theaters experience a heavy telephone "traffic" at this time of the day, as many tickets are ordered over the telephone and called for between the hours of 5 and 6 o'clock, the time many young men are relieved from work.

Telephone calls after 11 o'clock at night are infrequent, and those that come in at that time are usually of an urgent nature, as a call for a doctor or ambulance or for a cab for the "knight of the grip," who wants to catch an early morning train. After 12 o'clock midnight and all through the wee hours of the morning it is considered almost remarkable for the whole force of twelve night girls to receive more than 90 calls.

ALL SERENE AT SIOUX CITY.

Judge Carland, on behalf of the attorneys for the plaintiff, has dismissed the case of the Royal Trust Company of Chicago vs. the Citizens' Telephone Company of Sioux Falls, Iowa. All differences have been adjusted and all debts satisfied, and the company placed on a new footing. The following officers have been elected: President, W. T. Doolittle; vice-president, Sam Fantle; secretary, W. G. Porter; treasurer, H. R. Dennis; manager, Walter Haskell. The company has established over 1,500 telephones in the city within the last two years, in addition to having 200 miles of long-distance lines and connections.

The Situation in Connecticut

D. A. REYNOLDS.

THE constitution of the State of Connecticut in its declaration of rights, Section 1, declares:

> That all men when they form a social compact are equal in rights, and that no man or set of men is entitled to exclusive public emoluments or privileges from the community.

Notwithstanding this noteworthy declaration, Connecticut bears the unenviable distinction of being the only state in the Union where a "set of men" enjoys the "exclusive public emolument" and "privilege" of supplying the citizens of that commonwealth with telephone service at prices 200 to 300 per cent higher than they would have to pay under competition, and collecting from $400,000 to $500,000 a year more for their service than it is worth.

When the great Bell monopoly "carved up this republic" into its original seventy-two operating companies, the state of Connecticut was assigned to the Southern New England Telephone Company, which has enjoyed the absolute telephone monopoly in that state for something over twenty-five years. At its inception, the "mother company," in order that its offspring might not forget the source of its origin, is said to have placed $1,750,000 of its stock (promoters' shares) in the Boston strong-box, while the balance was distributed according to the usual Bell methods. Since this original issue, other stock has been issued from time to time, finding its way into the hands of "innocent purchasers" until the present capital stock amounts to $5,000,000, with a bonded and other indebtedness of over $1,000,000. At its recent annual meeting, January 31 last, it voted to increase this amount by $500,000.

The last annual report of the Southern New England Telephone Company shows a total of 32,205 telephones in a population of about 1,000,000, or an average of one telephone to every thirty people in the state. The state has been partitioned off into "divisions" or "telephone zones," within which is accorded a 5-cent or a 10-cent rate, the rate between such zones being 25 cents. These divisions, or zones, embrace from a few telephones in the smaller cities to four or five thousand in the larger cities, the rates for a private circuit varying from $48 to $96 a year where there is no competition, and as low as $9 a year where there is competition.

I have before me at this writing an accepted contract for a *business telephone* in the city of Winsted (population 7,000) at the rate of $24 per year, to which has been pasted before acceptance, a slip containing the following:

> It is mutually agreed between the parties hereto that in consideration of the terms of this contract the subscriber shall be furnished *without expense* to himself local service in the Winsted exchange for a period of *six months* from the date of the installation of the station called for by this contract.

Winsted, it will be remembered, has an Independent telephone company serving 450 subscribers, while the entire Winsted division of the Bell system, including five adjacent villages, number only 440, notwithstanding their six months free service clause.

In Sharon, where another Independent company has built up a system of 275 subscribers, the Southern New England has been content with a *single instrument* as a pay-station.

The service in Connecticut differs very materially from that rendered in the western states, and especially that rendered by the Independent companies. A careful study of the telephone directory shows between five and seven party-line telephones to every private line, thus overloading the switchboards with a corresponding sluggish service. In the entire Wallingford division there are only thirty-seven telephones operated on private wires, while some of the party-line wires have as high as twenty-one instruments on a line. The entire division of Winsted in the Southern New England system, embracing five villages, has but sixteen private lines and 424 party-line telephones. The wonder is how, under such conditions, they are able to give any service that even the people of Connecticut will accept.

The prices charged for this service range from $18 to $48 a year, or about what should be charged for private line service with all modern equipment in a territory so densely populated as Connecticut. The state also has been divided and sub-divided into upward of fifty divisions, or telephone zones, so arranged as to secure "all the tariff will stand." It is not unusual to find tariff rates between cities far in excess of railroad fare.

Little or no improvement has been made in the equipment of the system for the past fifteen years. Nearly every telephone is of the hand-organ (magneto) style, while the central office equipment is equally venerable. With competition excluded by law, there has been no incentive to modernize the service, and the management has been content to "let well enough alone." The two or three small Independent companies in the state have been circumscribed by special enactment, and the state of Connecticut is fully ten years behind other states in this respect.

A fair idea of the volume of service rendered by the Southern New England Telephone Company may be gained from the number of telephones per population in a score or more of their divisions, or telephone zones, as taken from their latest directory. These figures will be interesting to the western readers of TELEPHONY, many of whom enjoy a service as great as one telephone to every seven people. Starting with the Danbury division, embracing 408 telephones to serve 25,441 people, besides the rural district, we find twenty-two of the principal zones to rate as follows:

Danbury division	1	telephone to	62	population
Farmington division	"	"	57	"
Guilford division	"	"	53	"
Enfield division	"	"	50	"
Norwich division	"	"	50	"
Rockville division	"	"	50	"
Willimantic division	"	"	50	"
Woodbury division	"	"	44	"
Southington division	"	"	40	"
South Norwalk division	"	"	40	"
New Milford division	"	"	35	"
Putnam division	"	"	35	"
Westport division	"	"	35	"
New London division	"	"	30	"
Torrington division	"	"	30	"
Waterbury division	"	"	25	"
Stamford division	"	"	24	"
Stonington division	"	"	23	"
Ridgefield division	"	"	22	"
New Haven division	"	"	21	"
Saybrook division	"	"	20	"
Hartford division	"	"	20	"

Notwithstanding the thousands of dollars paid annually to the Boston contingent as royalty on expired patents, said to be over $100,000 a year, besides the $1,750,000 promotion fund, the Southern New England Telephone Company has made many of its officers and directors very wealthy. Morris F. Tyler, for many years its president, has become rich, while A. Heaton Robinson, the recent democratic candidate for governor, is counted among the Connecticut millionaires. Samuel E. Merwin, Max Adler and Henry Jewell trace the bulk of their fortunes to the enjoyment of this state monopoly, while the other members of the board of

directors have not been unappreciative of the "public emoluments" enjoyed.

Four years ago the Southern New England Telephone Company secured the passage of eleven sections known as "Special Provisions Concerning Telephone Companies," in which all foreign companies are absolutely excluded, while local companies are estopped from further development until they have brought an action in their county court for the purpose of having it "judiciously decided" that there is a call for service other than that furnished by the monopoly. The hearing requires a vast amount of red tape requiring time, in which the monopoly invariably secures rights-of-way or some other insurmountable barrier, which effectually strangles its competitors, after which no further effort is made to cover the field unless such development happens to conform to its purpose. These "special provisions" were enacted into law upon the plea of the Southern New England Telephone Company that it had invested a large amount of money in the telephone business and that unless other companies were shut out of their field, it would not be able to make any money.

If this code of reasoning had been applied to the manufacturing industries of Connecticut, it is needless to say that the state would not, as at the present time, be one of the foremost manufacturing states in the Union. The policy of such a plea is also apparent from the last annual report of the Southern New England Company, which reports "operating" expenses at $268,600.89 and "general" expenses at $183,400.81, while it attributes to "maintenance" $481,598.80, or $29,597.10 more than it costs for both the main items! If the public could only have a peek at the items entered under that suggestive heading, "maintenance," they would probably see why Connecticut is bound hand and foot by this monopoly. If this item of nearly $500,000 a year is for the "maintenance" of its monopoly the people who "pay the freight" ought to cut it out of their next annual report.

Politically, this body of men have been able to wield a more effective power in the legislature of Connecticut than ever was exercised by Tweed in the city of New York. By this power they have been able, first through patents and later through legislation, to enjoy a monopoly in that state for over twenty-five years, which to-day is costing the users of the telephone fully $400,000 a year more than it would cost them were competition possible. Fully half of this amount goes out of the state every year in the form of royalties and dividends on promotion stock, while from the balance is apportioned the "sinews of war" that make such a monopoly possible.

In the pursuit of this policy, the Southern New England Telephone Company has taken to itself the brazen attitude of a public "lobbyist," and, unsolicited, has placed in the hands of every Senator and Representative a book of "franks," presuming, no doubt, that the use of a little free telephone service (service which costs the telephone company practically nothing) will so influence their public acts as to perpetuate itself in the enjoyment of its monopoly.

But the management is not satisfied with such intrenchment without publishing to the world a notice that its title to special legislation is complete, and that, too, in such unmistakable language as to constitute a standing insult to every man in the Connecticut legislature.

On December 17, about two weeks before the present legislature met, the "Mercantile and Financial Times," a "write-up" publication with offices in New York, Boston and Philadelphia, contained a "write-up" on the Connecticut situation, especially eulogistic of Morris F. Tyler, president, and the Southern New England Telephone Company, in which it was intimated that Independent telephone competition was about to enter that field. The writer continues:

We can scarcely believe it; we think it looks too gross, too plain a proposition to set before the people of Connecticut, who know how well and anxiously Morris F. Tyler and his associates have studied their wants and wishes in every direction. The 32,000 subscribers of the Southern New England Telephone Company cannot fail to see that an additional toll will have to be met, that no real advantage will be gained over the system which has been so carefully and wisely built up by their fellow citizens of the commonwealth. It is certain they will resent the proposed attack upon an institution which has deserved and does deserve well of the community, *for it appears beyond a doubt that this project will be fought by every means which a very clever and subtle management has at command. The people of Connecticut assuredly will see something of "lobbying" of the severest kind, with everything else which the word implies.*

If the above is not a notice of ownership of the Connecticut legislature, it is hard to imagine language more expressive. It is reported that 40,000 copies of this issue were mailed to people of Connecticut, and it is thus pretty safe to say that at least the telephone users of that state have been given notice that nothing might be expected of the present legislature. Happily, for the people of Connecticut, a large majority of the members of the legislature have not made use of their unsolicited franking privilege, and are free to act upon any measure that promises relief to their constituents.

MILWAUKEE AND THE TELEPHONE.

It is said that Elisha Gray, inventor of the speaking telephone, got the first suggestion for his instrument in Milwaukee. Back in the early 70's there were a number of string telephones in use around the Chamber of Commerce, and Gray, who was giving exhibitions of his telegraph in Milwaukee, saw one in use there.

The telephones were constructed in several ways. The most simple were made simply of two baking powder cans, open at one end, and with a piece of string stretched through the holes in the bottom, secured with nails or buttons. Others were made of tin cylinders with a drumhead of parchment. Still another form, the most elaborate, consisted of wooden blocks, with iron diaphragms. Gray was so impressed with the fact that the longitudinal vibration of the string transmitted the sound of spoken words distinctly, that he immediately started plans for an electrical apparatus to take the place of the string. In his own description of the perfected electric telephone, Gray says it was in Milwaukee that he saw the first acoustic telephone, which gave him his idea.

At that time Angus Hibbard, now general manager of the Chicago Telephone Company, was working in the office of Charles Ray, in Milwaukee, and rigged up a string telephone from his desk to an office in the Mitchell building. Through experiments with this, he became interested in telephones, and in consequence entered the business.

Several firms later started the manufacture of acoustic telephones, and they were in general use in small towns between the railroad stations and general stores. They were known as lovers' telegraphs, and, if properly constructed with a light steel wire, could be used over distances of two miles in a straight line. With the adoption of the electric telephone they went out of use.

TELEPHONE INJURES THE GRANGE.

The covering of the entire vicinity with rural free mail delivery and the construction of rural telephone lines on all the principal roads is working quite a change among the farmers about Union City, Michigan, and it seems to have principally affected the farmers' organizations. Two years ago Union Grange was one of the largest and strongest in that portion of the state, while the Union and Sherwood Farmers' Club had a wide reputation, with frequent meetings, elaborate programmes and attractive social features. Since the advent of the rural mail and the country telephone, however, interest in the grange has greatly waned, with no meetings in months, while the farmers' club has gone out of existence.

DIGEST OF TELEPHONE LITERATURE

Conducted by Samuel G. McMeen.

Developments in Municipal Telephony—London Electrical Review, February 3.

The several examples of municipal ownership of telephone exchanges in the United Kingdom continue to be a source of editorial and contributed discussion. The total of the knowledge which has reached this side to date does not enable an illuminating conclusion to be drawn. The editorial cited states, without qualification, that the Glasgow municipal system was laid out with an extraordinary disregard of accumulated experience, and that it has conspicuously failed to accomplish the objects for which it was started. It is said the service is ineffective and cannot be otherwise till a complete re-equipment is made. It is interesting to note that the system with which the Glasgow municipal enterprise competes is increasing at the rate of over 500 stations a month, which, at this juncture, indicates a rate of over 30 per cent per annum.

FINANCE AND ECONOMICS.

The Middletown Compact—Telephone Journal, January 28.

A reproduction of an agreement between the Hudson River Telephone Company of Albany, New York (licensee of the American Telephone & Telegraph Company), and the Orange County Telephone Company of Middletown, New York (an Independent company). Furnished as an example of the type of contract executed between the Bell company and Independent companies which become sublicensees of that corporation.

Telephone Dissatisfaction—London Electrician, January 16.

The association of telephone subscribers of Paris continues to gain strength and has retained Mr. Herbert Laws Webb of London, as its consulting engineer. Mr. Webb's first report treats the telephone system question generally, and in his comment concerning the relation of the Paris equipment to the best equipments elsewhere he places the former at a low point in the scale of excellence. Naturally the suggested cure is a complete reconstruction on modern lines, and it is estimated that the total cost of the conversion would be far less than the cost of a single battleship, somewhat less than the cost of an armored cruiser, and in every way well worth the price. Up to date Mr. Webb has not been granted permission from the French administration of posts and telegraphs to perform the desired inspection of the Paris exchanges, although a formal and urgent demand has been made by the association.

New York Telephone Agitation.

The technical press, and particularly the New York Herald among other periodicals, is filled during these times with matter of a more or less interesting and accurate character concerning rates, development and management of the New York Telephone Company, the Bell licensee for that region. The agitation has been carried to Albany, and a fair idea of the proceedings from time to time may be had by reading the Herald or extracts from it.

Profits in Independent Securities—CLENDENIN.—*Telephony*—February.

It is the conclusion of this financial analyst that Independent telephone securities afford a safe and profitable investment. From an examination of the dividend statistics of a group of fifty companies in Iowa, operating about 15,000 stations, it is determined that the lowest dividend declared by any of them in 1904 was 10 per cent, the highest was 25 per cent and the average was 17 per cent. It is interesting to observe that the capitalization per subscriber of the Bell company is nearly three times that of the Independent companies taken generally. Naturally, this is in some degree explained by the existence of certain very extensive large exchanges within the Bell system, but the explanation seems hardly to be conclusive.

Telephone Batteries—DOBBS.—*Sound Waves, February.*

Although the use of a central source of current for telephone lines has been most remarkably adopted since its advent in 1896, the use of local batteries has by no means disappeared, and a knowledge of the various forms is still an essential. For the energization of a local station transmitter, some form of sal ammoniac battery is still believed to be best, when all things are considered. It is only within recent times that sal ammoniac cells in zinc cases with sealed tops have been improved to a satisfactory commercial form, and they are now available at small prices under the name of dry batteries. It was inevitable that this result should be reached and now many wall sets for local battery equipments are designed for dry battery use alone. It is important to date the outer covering of a dry battery to show the time of its receipt. Careful tests should be conducted before deciding upon a standard type, and this can be done by means of measuring instruments adapted to be applied to a circuit involving the battery under test, a resistance, and a clock-driven contact-maker. A test continuing but a short time is less valuable than one extending over several months. Dry batteries should not be stored lying on their sides.

EQUIPMENT.

Canal Office Equipment, Cincinnati, Ohio—PEAVEY.—*Electrical Review, February 4.*

A new office has been added to the downtown system of the Bell company operating in Cincinnati, and it is here described by the engineer who designed and directed its construction.

Battle Creek, Michigan, System—Electrical Review, February 11.

An illustrated description of a new Strowger automatic system.

Extension Circuits—CLAUSEN.—*Sound Waves, February.*

In preceding sections of his series Mr. Clausen has covered sixteen circuit combinations involving a central office and two stations, one being a principal and the other an extension equipment. This article extends the series to include eight more or twenty-four combinations in all.. The arrangements are still adapted to a central office having a line and a cut-off relay and three conductors in the jack and cords.

The Automatic System and Its Critics—DURANT.—*Sound Waves, February.*

Some comment upon the automatic vs. manual question, including a statement of the results secured in St. Mary's, Ohio, from which it is reported that a saving has been effected of over 3 per cent on the capital stock because of not using the manual system.

Faller Semi-automatic System—ABBOTT.—*Telephone Journal, February 4.*

The substitution of mechanical methods for manual ones is a strong present tendency in telephony. Within the last few years a great many operations formerly performed manually by the subscriber or the operator in a manual system have been made automatic in their action. On other lines, the switching of telephone lines has already come to be extensively done by means wholly automatic, except as to the things manually performed by the subscriber. In the system of which a description is begun in this first installment of a serial, the manual activity of an operator is

retained, but she is put out of communication with the subscriber, by telephonic means, as she has no transmitter or receiver. The call of the subscriber is instituted by his setting up a number on four or five numbered dials and turning in the call thus indicated, by means of a rotatable shaft. The call appears upon a switchboard and is answered manually, but no speech takes place between the operator and subscriber. This is because the further operation of the sending device controlled by the subscriber automatically trunks the call to a division of the switchboard and finally indicates by a lamp adjacent to the called line what is the identity of the desired connection. Many of the features of the system are in substantial similarity with other completely automatic systems, but the principal results of the arrangement are to eliminate communication with the central office by speech and to reduce the amount of switchboard equipment of certain kinds.

Falier Semi-automatic System—ABBOTT.—*Telephone Journal, February 11.*

The second article of a series and deals with the central office equipment which co-operates with the substation equipment described in the first installment. As is true of common battery manual systems, each line is equipped with a line relay, which in turn operates the selector which is supplied with local power. The switchboard contains no multiple jacks, but is operated wholly on the transfer or local trunking plan. One of the peculiarities of this system is that in addition to indicating to what section or subdivision of the office equipment the call is to be trunked, the identity of the called line is made known by the selector picking out and illuminating the lamp of that line. It is the statement of the author that this is accomplished by a very ingenious application of the principles of co-ordinate geometry. The article contains a table which explains with great clearness the routine of connecting together two subscribers, whether these originate and terminate in the same section or in wholly distinct offices. The photograph accompanying the table points out very clearly the various parts of the equipment of a section. Each section accommodates 200 lines. In all ordinary connections there is no vocal communication between the operator and the subscriber. Further, when the talking circuit is once established it is practically the same as in any manual system, and party line signaling of any satisfactory type may be utilized. From the character of the information given by this article it would seem to be one of the first careful explanations of this interesting system.

The Telephone—TAYLOR.—*Sound Waves, February.*

This installment, which is the thirteenth of a serial, deals with trunking systems between various sections of a local switchboard. One system is that involving a call circuit and a magneto drop associated with the trunk, this being thrown by the insertion and again by the withdrawal of the plug from the trunk jack. The other arrangements involve the use of lamp signals and in this regard are distinctly better than the system first described, although it has been widely used.

South Bend, Indiana, System—Telephony, February.

A description of the equipment, statistics and personnel of the South Bend Home Telephone Company, under the guidance of Mr. Theodore Thorward. There are 3,200 telephones in service in the cities of South Bend and Mishawaka and 4,000 in Elkhart and its county. The Bell Company has only one-tenth as many in the last mentioned region.

Machine Made Cables—FRICKE.—*Telephony, February.*

The distinction of the term is that it applies to cables formed by machinery, except as to their ends instead of being made up from wire and thread wholly by hand. In any system of equipment, but particularly in a system involving a multiple switchboard, the planning and execution of the cabling not only represents a large part of the expense of the installation but in a very great degree controls the impression gained by an observer of the complete thing.

Modern Telephony—RADCLIFFE.—*Telephone Magazine, February*

The first installment of a serial intended to run through twelve months. This issue treating of receivers begins with an analysis of sound and leads into the construction of unipolar and bipolar instruments.

Local Cables—KNEISEL.—*Telephone Magazine, February.*

Local cables are those which lead from one to another group of apparatus within a given unit of apparatus, and as in other cables about a central office, an important present feature is that the insulation of each wire in the cable differs from all other wires having other duties to perform. The familiar methods of laying out the cable on paper on a board and running the wires around nails in that board are described in connection with instructions for sewing and treating the cable when finished.

Dixon, Illinois, System—Telephone Magazine, February,

An illustrated description of the new system in Dixon, in which little open wire is used.

The Central Energy Accumulator—BOND.—*Telephone Journal, February 18.*

Storage batteries are an essential part of central energy systems, and some account of the general character of such devices is given in this article. As an example of a high grade installation a photograph is given of a system involving forty cells, each in a lead-lined tank. Three types of plates are illustrated in another figure and some instructions as to installation and care are given.

Modern Line Construction—BELL.—*Sound Waves, February.*

LINES AND LINE CONSTRUCTION.

It has long been the supposition that underground construction is only warranted for use in the very largest exchanges. When the subject is given the study which is deserves it will be found that some underground construction is warranted in most of the moderate sized exchanges and in some of the small ones. Under present conditions not only is the cost of maintaining an underground system much lower than for any other, but the original investment often shows a balance in favor of the underground plan. Outside of the underground district cable may be used to advantage to a very large extent. As the cost of cables varies with the metal market prices of this material should be watched closely. In arranging the conduit system the number of extra ducts for future growth should be given the closest attention. A trench twenty inches wide and eighteen inches deep is said to cost from seven to fifteen cents per running foot, according to the nature of the soil. It is estimated by the author that within the next five years fully fifty per cent of the moderate sized exchanges will need to be rebuilt. Such systems as have been built with a minimum of open wire have suffered least from the heavy recent sleet storms. In the reconstruction of those systems involving much open wire there seems to be but one answer as to the method which shall be used, and that is to so plan and execute the work as to eliminate all heavily loaded open wire routes.

Telephone Line Engineering—WOODBURY.—*Electrical Review, January 21.*

An analysis of some of the facts of line construction is striking for the great amount of valuable information contained in its various paragraphs. A proper digest would be of about the same length as the article, which is one of about 5,000 words, well worthy of careful reading.

Telephone Construction Practice—MINHINNICK.—*Telephony, February.*

The first article of a serial. In preliminary arrangements, score construction, a thorough and exact organization of methods of responsibility is extremely important. To compel an individual to serve two masters on the same task is as disastrous as to divide the responsibility for a single performance between two heads. Much valuable comment upon organization is contained in this preliminary chapter.

Simple, convenient and accessible systems of filing supplies and tools are as important as filing systems for records and specifications. Examples of both are given in some detail in this section.

Telephone Lines on Single Phase Trolley Road—Electrical Review, February 18.

The Indianapolis & Cincinnati Traction Company has begun regular service with a car equipped with single phase alternating motors and upon the same pole line, and but a short distance away are carried the four wires of two metallic telephone lines. There are transpositions in these lines every 500 feet and porcelain insulators are used. Each car is provided with a telephone and connection may be made with the telephone line at intervals of 2,000 feet.

Preserving Poles—Electrical Age, February.

Careful experiments have been carried on in collaboration between the Bureau of Forestry and two of the largest users of poles. Most of the decay of a wooden pole is in the part a few inches above and below the surface of the ground. Chestnut and white cedar poles have been found to outlast those of other woods, but as to this a line of fifteen years may be said to be a maximum. The conclusion of the test up to this time is that the creosote method is the best, and it is probable that cross arms also will be found advisable for treatment.

Hints on Rural Line Construction—PRICE.—*Telephone Journal, February 4.*

A section of the second article of a series, and deals with the use of braces for pole supports instead of guys, and the principal requirements of care necessary in setting poles by hand. Braces should be attached to the poles by means of two through bolts, and these should be six inches apart. Two types of "dead-men" are illustrated. In the use of pikes, men should be warned not to hold the pikes against their bodies under their tool belts. Other than short and light poles should not be raised with the cross arms in place. Brackets may be attached before setting the poles and in such cases care must be taken to see that the nails in the brackets will not obstruct future holes for cross arm bolts.

A Study in Traffic—Telephone Journal, January 21.

OPERATING.

Previous articles of this series have treated the determination of the amount of switching done in a central office by means of counting devices upon which each connection is recorded. This article takes up a study of other means of arriving at the amount of work done in the office. One of these methods is termed a plug count, and is a different one from the method ordinarily termed a peg count. The difference is that in the case of the peg count each call or each connection is noted and the increasing number recorded by moving a peg from hole to hole in a row of holes, or by actuating some counting mechanism. In the plug count method the number of answering jacks which contain plugs is counted at each position at short intervals. By comparing the record taken in this way with simultaneous peg counts certain ratios can be determined between the number of plugs in place and the number of originating calls. A slight variation of this method is to count the number of plugs which are not in use at each keyboard at a given time. This number subtracted from the total number of plugs on the position will enable the number in use to be known at once. The plug count method has two distinct advantages. One is that it imposes no extra burden upon the operators, and the other that it is quick, because it requires no special mechanism or preparation. In common battery central offices there is another means of determining the traffic of the office, and that is by determining the amount of current furnished to that part of the equipment which has immediately to do with the current supply for conversations. There are two ways of conducting such an observation, one being to record the reading of the meters furnishing this current, these observations being taken from minute to minute, or something on that order. The other method is to make the meters of a recording type, in which case the variations and amounts will be set down by automatic means and the record may be removed at the end of a predetermined time. It is to be noted that peg counts and plug counts give results in terms of number of connections, while the meter recording methods take into account the length of conversation. As it is no more work for the operator to put up a connection which results in a long conversation than one which is taken down almost immediately, the thing needed to be known, so far as the work of the operators is concerned, is a thing not involving length of conversation. Amount and character of equipment, however, do require that mean length of conversation be considered. The article contains a curve which may be used to determine the probable use of the telephone and enables discrimination to be made between expected rates of calling under flat and measured systems of charging. It is not to be thought that determinations of traffic amounts are of value to the equipment engineer alone. It is probably true that the management of continuous affairs is much more concerned in traffic conditions than is the equipment engineer, for the character of service furnished with a given equipment may be carried from a grade of possible acceptability up to a grade of high perfection without materially modifying the physical arrangement.

Concerning Party Line Switching—MCMEEN.—*Telephony, February.*

An illustrated description of two ways of handling two-party and four-party signaling, involving the use of one or more jacks per line.

Some Exchange Record Forms—Telephone Journal, February 11.

With a due recognition of the fundamental value of systematic work in telephone exchanges this author furnishes five examples of valuable blanks having to do with line and apparatus, trouble, construction and maintenance records and reports. Not only is it essential that the daily routine of these activities be recorded and classified, but the fullest value of the operation of the system can only be secured by reasonably frequent analyses of the knowledge accumulated in this way.

Designating Symbols for Switchboards—PAXTON.—*Telephone Journal, February 4.*

When all the conditions of the lines in a central office and the stations upon them are exactly the same as the designations in the existing directory, it is not necessary to have any marks upon the multiple jacks. As the issue of a directory increases in age, changes take place so that for the proper information of operators marks must be placed adjacent to the jacks. If all lines are individual ones a discontinuance may be indicated by a properly colored dummy plug in the jack. If the subscriber on a line has suffered a change of number, a properly colored dummy plug to indicate that fact may also bear the new number, which will secure that subscriber. Temporary discontinuance may be shown by a plug of still another color, and so on. If a line carries more than one station it is manifestly not possible to denote changes of its stations by placing colored plugs in the jacks of the line because access to the jack will still be necessary, though changes may have occurred with reference to one of its stations. In this emergency advantage is taken of marks, usually of paint, beside or below the jack. The color of these marks, as well as their shape and position, may be made to indicate the necessary intelligence. Other designations than those having to do with the multiple jacks are required in connection with answering matters, and it is convenient to indicate these upon the lamp caps. The article makes clear many of these variations in which dots, circles and lines of black are placed upon the opal surface of the cap. Still a further classification is made by varying the colors of these marks.

Organization of a Central Office—O'BRIEN.—*Telephony, February.*

The second article of a series. The chief operator constitutes the connecting link between the manager and the of-

fice force, and her position and responsibilities are important. The article contains information as to the variety of the duties of the chief operator, and it is said that occasional conclusion is drawn that in a properly conducted central the supervisors and assistants will be found of great value. In handling service on a flat rate method of payment it is not necessary for the operators to make tickets of the calls. Where the ticketing method of measured service charging is used the collections should be made each hour. Supervisors should make such observations as will enable them to recommend how the lines should be redistributed from time to time to even up the load upon the operators. The general conclusion is drawn that in a properly conducted contral office, where the loads are so arranged as to work each operator close to the limit of her capacity there is very little time for breaking rules and little necessity for discipline.

Duties and Dangers of Telephone Line Men—COBURN.—*Telephone Magazine, February.*

The term lineman may mean a person engaged in the construction of telephone lines, or it may refer to a person engaged in maintaining lines. While it is ordinarily supposed that a lineman is one who climbs poles, this is really true to-day only of one of the various classes known as trimmers, diggers, gainers, pole setters, fillers, wire stringers and bankers. Men filling the positions of the latter class are not fiscally but physically employed, as it is their duty to bank the earth about the bases of the poles.

The Development of Telephone Cables—WILHELM.—*Telephone Journal, January 21.*

GENERAL TELEPHONE ENGINEERING.

The first article of a series. The placing of conductors of electric circuits in cables was first done in the attempt to lay telegraph lines in the bottom of the sea. It was found impossible to arrange telegraph lines in this way and still operate ordinary telegraph apparatus across the Atlantic Ocean By modifying the apparatus, however, it was found possible to use these lines in a successful way. Over anything except reasonably short lines in cables of the construction first used, telephone conversation was impossible. With the very great development of telephone service in the larger cities it became evident many years ago that the wires must be confined in a smaller space. The formation of telephone cables from small wires has made reasonably rapid progress and to-day there is no reason why telephone wires may not be enclosed in pipes, whether they are hung on poles or are laid under the ground. There are four properties pertaining to telephone lines which govern transmission and limit the distance over which it may be carried on. These are resistance of the conductor, insulation resistance, static capacity and induction. All of these, except static capacity, can be cared for in the design of the cable, and even the latter has been reduced by successive changes in cable manufacture until it is now within reasonable limits. The article refers to the early classical experiments of Mr. Carty with reference to mutual interferences between telephone lines.

The Televue—FOWLER.—*Sound Waves, February.*

A communication from the inventor of a device for seeing by electricity, in which he states that he has not destroyed his invention, but is continuing his investigations. The article is illustrated by a photograph of the device and by portraits of the inventor and his daughter. It is said that the face of this young lady was the first seen over the apparatus. Letters included and quoted in the article indicate that actual results have been secured.

Wave Distortion—FRANKLIN.—*Electrical Review, February 11.*

A lecture delivered before the New York Electrical Society January 18, and develops in a mathematical treatment with figures what happens to a wave in passing over a circuit. As the matter of telephone communication is so distinctly one of wave transmission, the address and its discussion should be found of value in study.

Wireless Telephony—COLLINS.—*Technical World, March.*

This author, who has done much writing on telephone and telegraph subjects, analyzes the general subject of electrical communication, and describes the radiophone of Bell, and the somewhat similar system of Ruhmer. Both of these, as is generally known, are systems which transmit light with such a sequence of changing conditions as to enable speech to be heard at the receiving point. A third system of wireless telephony, designed by Mr. Collins himself, seems to involve the use of Hertzian waves and electrolytic detectors. He reports that articulate speech has been transmitted successfully over a distance of three miles and a half.

Wireless Telephony—NUSSBAUMER.—*Physikalen Zeitschrift, December 1.*

In wireless telephony of the true sort electromagnetic waves in the ether should be produced by the vertical wire at the sending station, these having such variations as to correspond in some degree to the variations of the transmitted speech. This article describes investigations along this line, in which the speaking arc is utilized in producing the necessary waves. While the speaking arc is used in the photophone system of speaking without wires, this method does not depend upon the transmission of light, but of Hertzian waves.

Manufacture of Air Insulated Cables—GUARINI.—*Electrical Review, January 21.*

The use of insulating material for the conductors of cables has run through a series of characters, most of the earlier materials being naturally adapted to maintain insulation by their own virtue. Due to the persistent work in developing cables of low static capacity for telephone lines, fibrous materials containing much air have been made possible as insulating substances. To secure the value of such construction the paper or other air-enclosing substance, must be made and kept thoroughly dry. Other than telephone cables are now being made with air insulation, and this article describes and illustrates with eleven photographs the apparatus and methods of the Siemens & Halske cable works at Nonnendamm.

Railway Composite Systems—WILDER.—*Sound Waves, February.*

Since it has been discovered that a fairly satisfactory service may be secured by using telephone instruments on an existing single wire telegraph line, even though quadruplex is working on that wire at the same time, much extension has taken place in that direction. This installment of a serial is devoted to a statement of the preliminary principles requiring to be known.

The Velocity of Sound—HEBB.—*Physical Review, February.*

The story of a redetermination of the velocity of sound, the excuse for a new effort very naturally being that the results obtained in various trials usually differ from each other. In this instance the telephone is employed as a part of the apparatus, which illustrates once more the fact that every new device assists in the general determination of important physical facts.

Phantom Telephone Circuits—ROBINSON.—*American Electrician, February.*

By a phantom circuit is meant one which in the strictest sense has no wires strung especially for it, but which is formed by using jointly for each of its sides the two conductors of an actual line. Thus two circuits of two wires each provide the necessary material for one phantom circuit, and it is possible to extend this still further by securing one-third phantom from the use of two phantoms. A drawing with this article shows the arrangement of repeating coils.

Telephone Repeater—Finance, January 28.

Finance is authority for the statement that the long sought repeater has been provided, and that it will make commercial conversation between Boston and San Francisco a possibility of the near future. The direct statement is made that a long-distance line now under construction between Omaha and Denver will be completed, and it is assumed that this, by means of the repeater, will put Denver in touch with the Atlantic seaboard. Important, if true.

In the Financial Field

KEYSTONE TELEPHONE COMPANY'S ANNUAL STATEMENT.

THE annual report of the Keystone Telephone Company of New Jersey, which operates in Philadelphia, for the year ending December 31, 1904, shows for the year 1904 gross earnings of $685,740, and net, $352,438, against $481,225 and $232,515, respectively, for the year 1903; for the month of December, 062,328 and $32,308, respectively, against $50,444 and $27,003, respectively, in December, 1903.

President John M. Mack says: "The increase in gross earnings over the year 1903 amounts to $204,516 and in net earnings to $119,923. The business is in a healthy condition, and there is every indication that the increase will be greater this year than the year 1904. New contracts are coming in in a very satisfactory manner, and our service is being kept up to the usual high standard. Our new January catalogue will cover not only Philadelphia, but surrounding towns in the counties of Delaware, Chester, Montgomery, and all of Southern New Jersey.

"Since the report of December 31, 1903, the company has expended on extensions and increase to plant, $346,622. We now have over 16,000 telephones, and all our business is profitable. We have not considered it wise to install pay stations and free telephones in order to increase our subscribers' list, regardless of their earning capacity. Our conduit system is the most extensive owned by one company in any city in the world. We have 10,515,153 feet of conduit connecting to 5,158 manholes, and covering 229 miles of street. At present we are using 1,523,000 feet of conduit and leasing to telegraph companies and others 150,000 feet.

"Since the last annual report all of the buildings have been completed and all of the six exchanges are in operation, and no further investment will be necessary in real estate. About $65,000 has been expended during the year extending the Main and Race switchboards. Some slight additions to our West Philadelphia switchboard may be necessary during the present year, as the business is growing rapidly in that section. We estimate that the company should connect 4,000 new telephones during the present year. Our long-distance business is increasing rapidly, and we can now reach all points in eastern Pennsylvania, Delaware, Maryland and southern New Jersey."

Balance sheet of New Jersey (parent) corporation, December 31:

Assets.	1904.	1903.
All of the 2,500,000 common stock of Keystone Telephone Co. of Phila.	$4,432,712	$4,433,712
2,500 first mortgage of Keystone Telephone of Phila	2,500,000	2,500,000
Current assets	546,406	439,982
Taxes (prepaid)	2,413	2,408
Total	$7,482,531	$7,376,102
Preferred stock outstanding (6 p. c. cum), $50 shares full paid	$1,936,850	*$1,936,800
Common stock in $50 shares, full paid.	5,000,000	5,000,000
Current liabilities	300,000	312,636
Accrued liabilities (interest)	8,150	8,150
Undivided profits	116,857	.....
Interest received in excess of interest, payable to December 31, 1904	120,674	118,516
Total	$7,482,531	$7,376,102

*Authorized issue, $5,000,000, of which $3,063,200 unissued.

On February 29, 1904, beside the $2,500,000 each of stock and first mortgage bonds which were owned by the parent company, the Keystone Telephone Company of Philadelphia (the Pennsylvania corporation) had outstanding $2,357,728 of notes payable.

MAKES A FINE SHOWING.

The Delaware & Madison Counties' Telephone Company of Muncie, Indiana, is in a highly prosperous condition, as is shown by the following statement for the year 1904, as compared with the same periods for 1903:

	Dec., 1904.	Dec., 1903.
Income from rentals	$ 7,049.59	$ 5,113.43
Income from tolls	1,528.26	964.38
Building rent	135.00	135.00
Discount	26.37	.....
Gross income	8,694.15	5,321.16
Operating charge, taxes and insurance	4,779.67	2,847.41
Net income	3,914.48	2,473.75
Interest	1,803.62	1,441.46
Surplus for stock	2,110.86	1,032.29

Statement for twelve months ending January 31, 1904:

	1904.	1903.
Income from rentals	$75,426.22	$51,896.43
Income from tolls	15,588.95	8,454.87
Building rent	1,620.00	1,620.00
Discount	221.27	7.96
Allowances	732.99	2,077.85
Gross income	92,123.45	59,901.41
Operating charge, taxes and insurance	46,452.58	32,730.77
Net income	45,670.87	27,170,64
Interest	21,013.83	15,505.97
Surplus for stock	24,657.04	11,664.67
Surplus for 1903	11,664.67	
Surplus for 1904	24,657.04	
	$36,311.71	
Dividend 3 per cent	15,000.00	
Net surplus carried forward to 1905	$21,311.71	

NEWARK COMPANY'S EXCELLENT STATEMENT.

At the annual meeting of the Newark (Ohio) Independent Telephone Company Manager C. E. Hollander and Treasurer Edward Kibler made their yearly reports, which showed a very gratifying condition of the Newark exchange. During the year ending December 3, 1904, the number of subscribers increased from 1,203 to 1,811, and the toll receipts showed an increase of 100 per cent over two years ago.

Besides paying dividends on both common and preferred stock last year, the company invested nearly $10,000 of its year's earnings in extensions to the plant. During the year the company spent $21,038 in enlarging its plant. The company now has 75,000 feet of cable running to all parts of the city and has property worth $180,000, including the plant at Granville, which is valued at $10,000. At present the capital stock of the company is $100,000, of which sum $60,000 is common stock and $40,000 preferred 6 per cent stock. By a unanimous vote the stockholders decided to increase the capital stock to $150,000 by the issue of $50,000 additional preferred stock. This money will be used in adding to the size of the plant and in building lines leading into the country to supply the demands of the farmers for telephone service. The company now has about 75 stockholders. The officers announce that the entire property is in first-class condition, funds being set apart to keep the exchange in perfect working order.

AKRON PEOPLE'S TELEPHONE COMPANY.

One of the most successful telephone companies in Ohio is the Akron People's Telephone, of Akron, and its statement for 1904, just issued, makes a splendid showing. The company has an issued capital stock of $338,500 and a bond issue of $338,500. The surplus earnings of $21,218 are 6½ per cent on the capital stock. Here is the statement:

Gross	$90,516.55
Operating	51,669.92
Net	38,846.63
Fixed charges	17,628.34
Surplus	21,218.29

ANNUAL MEETING OF THE CUYAHOGA COMPANY.

The annual meeting of the Cuyahoga Telephone Company of Cleveland was recently held, and the reports submitted show that the company has had the most successful year of its history. The comparative balance sheets for 1903 and 1904 show the following conditions:

ASSETS.

	Dec., 1904.	Dec., 1903.
Property and plant	$4,862,633.52	$4,444,710.00
Treasury stock—preferred	741,750.00	837,950.00
Material and supplies	47,169.03	54,344.01
Current assets	96,858.60	86,734.18
Deferred assets	5,273.32	4,645.76
Total assets	$5,753,684.47	$4,428,838.95

LIABILITIES.

Capital stock—common	$1,500,000.00	$1,500,000.00
Capital stock—preferred	1,500,000.00	1,500,000.00
Mortgage bonds	2,233,000.00	2,233,000.00
Current liabilities	437,121.44	171,338.14
Deferred liabilities	10,474.81	6,844.72
Reserve for dividends on preferred stock	45,495.00	1,800.00
Reserve accounts—sundries	1,201.07	.....
Total liabilities	$5,727,292.32	$5,412,982.86
Surplus	$26,392.15	$15,401.09
Total	$5,753,684.47	$5,428,383.95

In the year just closed the company showed gross earnings of $435,274.02 against $396,490.20 for the year before and expenses of $220,748.79 against $194,191.90.

BRIEF FINANCIAL NOTES.

The Saranac (Mich.) Telephone Company has declared a dividend of 8 per cent.

The Muskegon (Mich.) Telephone Company has declared a 4 per cent dividend.

The Chippewa County (Wis.) Telephone Company has declared a 6 per cent dividend.

A 5 per cent dividend has been declared by the Hutchinson (Minn.) Telephone Company.

During 1904 the Valley Telephone Company of Lebanon, Ohio, made a clear profit of $10,000.

During the past year the Valley Telephone Company of Saginaw, Michigan, paid $16,244.49 in dividends.

The Citizens' Telephone Company of Montevideo, Minnesota, declared an semi-annual dividend of 3 per cent.

The Citizens' Telephone Company of Racine, Wisconsin, will soon offer for sale bonds to the amount of $200,000.

The Citizens' Telephone Company of Delaware, Ohio, has increased its capital stock from $100,000 to $125,000.

The State Long-Distance Telephone Company of Elkhorn, Wisconsin, has declared a 10 per cent stock dividend.

The directors of the Home Telephone Company of Hamilton, O., have declared the regular quarterly dividend of 1 per cent.

The Johnstown (Pa.) Telephone Company will increase its capital stock from $200,000 to $400,000 and will make extensions.

The New Tri-State Telephone Comany of Austin, Minnesota, has declared a dividend of 6 per cent in cash and 8 per cent in stock.

It is now said that the Keystone Telephone Company of Philadelphia has made no deal for the sale of its underground conduits.

The Pittsburg & Allegheny Telephone Company has appropriated $500,000 for improvements to be made within the next six months.

The Beaver Township Telephone Company of North Lima, Ohio, recently held its annual meeting and declared an 8 per cent dividend.

The Galva (Iowa) Telephone Company has declared a 6 per cent dividend on its capital stock of $7,500 in addition to a 14 per cent stock dividend.

The Tri-State Telephone Company of Austin, Minnesota, at its annual meeting declared a dividend of 6 per cent in cash and 8 per cent in stock.

At its recent annual meeting the Hamilton (Mich.) Mutual Telephone Company declared a dividend of 33 1-3 per cent and doubled its capital stock.

At a recent meeting the directors of the Muskegon (Mich.) Citizens' Telephone Company declared the usual semi-annual dividend of 4 per cent.

The Twin City Telephone Company of Minneapolis has declared the twelfth quarterly dividend of 7 per cent per annum on the preferred stock of the company.

The York County (Neb.) Independent Telephone Company has just paid its 5 per cent semi-annual dividend, making a total of 10 per cent net dividend for the year.

The West Virginia and Western Telephone Company of Parkersburg, West Virginia, has declared a 20 per cent dividend on preferred stock and 16 per cent on common stock.

The directors of the United Telephone Company of Monroe, Wisconsin, have declared a dividend of 4 per cent for the past six months, which is two-thirds of the net earnings.

At the semi-annual meeting of the Georgia Telephone & Telegraph Company, at Savannah, Georgia, a dividend of $2.50 per share was declared. Reports showed the business to be in excellent condition.

The Consolidated Telephone Company of Weyauwega, Wisconsin, has decided to increase the amount of preferred stock from $100,000 to $200,000. There is $400,000 of the common stock outstanding.

At the annual meeting of the Missaukee Telephone Company of Lake City, Michigan, it was voted to declare a dividend of 6 per cent in addition to the regular 8 per cent already paid during the year.

The Syracuse Telephone Company and the Columbia Long-Distance Telephone Company, at Syracuse, New York, have decided to make extensive improvements, involving an expenditure of more than $1,000,000.

The Blue Earth County Telephone Company of Lake Crystal, Minnesota, recently offered for sale $14,000 in preferred telephone stock, bearing 8 per cent interest, redeemable at the option of the directors of said company in three years.

At a meeting of the stockholders of the Marathon County (Wis.) Telephone Company the president and secretary were instructed to sell $2,000 worth of stock to pay the outstanding indebtedness of the company. The profit on the stock last year was almost 20 per cent, but was applied on the indebtedness.

The sum of $1,779.01 has been paid into the city treasury of Kansas City by the Home Telephone Company, which

represents two per cent of the gross receipts of the company for the three months ending December 31, 1904. During the ten months the company has been in operation its total gross receipts have been $236,038.84 and the city's share of this sum has been $4,702.77.

The Toledo (Ohio) Journal says: "Home Telephone stock has experienced a big advance, when 65 shares brought 30¼, the highest price this stock has ever brought. On the curb, 100 shares sold at 29½, while 200 shares brought 30. The stock closed at 30¼ bid, 30½ being asked. The unprecedented rise was probably occasioned from the fact that dividends are to be paid about April 1." between Philadelphia and Atlantic City during the past year, and first-class service is maintained."

At a recent meeting of stockholders of the Standard Telephone Company of Waukon, Iowa, the officers of the company were authorized to negotiate a $40,000 bond issue. During the past year the company has improved the entire system at a cost of about $6,000, and aside from this has paid about $5,000 of the old indebtedness. A committee was appointed to audit the books and report at the next annual meeting.

Advices from Cleveland state that the affairs of the Everett-Moore syndicate have been satisfactorily adjusted, the indebtedness taken care of and the energetic gentlemen interested find that after wiping out nearly $17,000,000 of liabilities they still own several telephone and trolley lines, in addition to Cleveland real estate and bank stocks. It is said that they are now in a position to go ahead with some of the plants they had under way when they became embarrassed.

The common council of Superior, Wisconsin, has passed an ordinance granting the People's Telephone Company of that city the privilege of issuing $100,000 bonds against its plants and rights. The Minnesota Loan and Trust Company now holds $30,000 worth of bonds against the company. The same become due in June and it is the intention of the company to take these up and apply the balance on making improvements and extensions of their lines in the city. A new exchange building will be erected.

The continued strength of telephone securities has been the feature of recent trading in local securities on the Indianapolis Stock Exchange. The market has been practically cleaned of New Long-Distance Telephone stock that can be bought under 60, recent sales having been made around 59, and none being offered under 60½. The stock has advanced from 51 to its present mark since January 1, apparently with no "inside support" and nothing except the demand from local investors to cause the advance.

The Cuyahoga Telephone Company of Cleveland will issue an additional $167,000 of 5 per cent gold bonds, making the present outstanding issue $2,400,000. Of the new issue $32,000 will be used to purchase the Collinwood telephone plant and the remainder will be put in the treasury of the company until such time as a fair market price can be realized for them. The total authorized issue of Cuyahoga telephone bonds is $3,500,000 and the company may issue under this mortgage $1,100,000 additional bonds. The new bonds are issued as a result of the installation of main line telephones.

INDEPENDENT TELEPHONE COMPANIES MAY EMBARK IN TELEGRAPH BUSINESS.

In all probability the Independent telephone long-distance companies of the United States will embark in the telegraph business within a short time in direct competition with the Western Union and Postal companies, says Finance. The matter has been under consideration for some time and has been very favorably considered by all the representatives of the Independent long-distance companies. No action will be taken for some time to come, but it is significant that all the head officers of the various long-distance companies regard a telegraph system as not only a possibility but a strong probability of the near future.

The installation of a modern telegraph system could be done by the Independent people with very little expense. The Independent telephone people believe that they have splendid facilities for getting a very large telegraph business just as soon as they are ready to go after it. They would be under small expense and they could utilize their local offices for the telegraph office, and in the smaller towns the manager of the telephone department would also look after the telegraph business and in many cases be the actual operator. In addition to this the stockholders of the various smaller companies are all located in the towns where the plants are and are generally the business men of the various towns. Therefore, they would be only too glad to throw their business to the new company. It is said that the Independent people are equipped to immediately put in a revenue producing company with very little additional capital within a very few weeks after it is decided to do so.

Such a company would add enormously to the already good profits of the Independent long-distance companies. It is generally known that it is possible to use the same wires for telephone and telegraph business simultaneously, and that it is necessary to maintain the wires at a greater efficiency for telephone service than for telegraph service. In the new scheme there would, therefore, be no additional expense for maintenance.

While it is impossible at the present time to say just when a start will be made on this new scheme, an early consolidation with either the Western Union or Postal companies may be expected to come. There are those who predict an early consolidation of the Western Union Telegraph Company with the Independent long-distance companies and the Postal company with the Bell company. If the Independent people were to seriously enter upon the work of organizing and operating a telegraph company a consolidation with the Western Union would doubtless be hastened. The Western Union could very nicely carry on the present long-distance service of the Independents and use much of their mileage for telegraph service. In addition they could also greatly strengthen the Independent long-distance service by using part of their telegraph mileage for telephone service.

In this connection it might be well to state that considerable progress is now being made in developing the long-distance service of the Independent systems. The No. 8 copper wire between Richmond, Indiana, and Indianapolis will be up within a very few days and after that time it will be possible for Cleveland to talk with St. Louis, Kansas City, and even farther west on Independent lines. Louisville, Kentucky, is now talking with Indianapolis, Kansas City and St. Louis on Independent lines. This new line will greatly aid in increasing the earnings of the long-distance companies operating in this territory, including the United States Company, which has a monopoly in Ohio.

In the northwest the Twin City Telephone Company now has wires from Duluth, West Superior and La Crosse, Wisconsin, to South Dakota, and the work of development is going steadily forward.

The Kenosha (Wis.) Telegraph-Courier voices the general sentiment when it says: "Business men who have to use the long distance telephone will welcome the day that the Independent companies complete their connections with Chicago and Milwaukee and enter the field as competitors of the Bell monopoly for long-distance business. Any kind of competition would help matters immensely."

Simultaneous Telephony and Telegraphy

C. A. STONE.

MY reason for choosing the subject of simultaneous telephony and telegraphy is this: I believe composite telegraphy and telephony has great possibilities, but owing to conditions over which you or I have no control, simultaneous transmission of sounds and signals over the same circuit has never had a fair chance, at least, it looks that way to me.

The first thing to be considered is this: How is it possible to telegraph and telephone over the same line at the

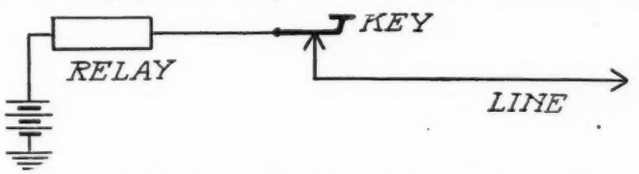


FIG. 1.—SIMPLEST FORM OF TELEGRAPH CIRCUIT.

same time without interference? How is it done? What does actually take place? It looks difficult, and it is difficult: and it is only lately that it has come into any degree of general use. We will first take a simple telegraph circuit.

The current used in manually operated telegraphy we all know must be direct current, slowly interrupted by the opening and closing of the telegraph key about four to eight times per second, according to the speed of the operator. The telephone current, on the other hand, is alternating, about 600 ups and downs, or an average of 300 complete cycles per second. It follows now that we must necessarily build our telegraph apparatus so as to respond readily to the slow interrupted direct current and not to respond to the high frequency alternating current of everyday speech. We must next arrange our telephone apparatus in such a way that they will respond to slowly interrupted direct currents and still not miss one single impression of the alternating

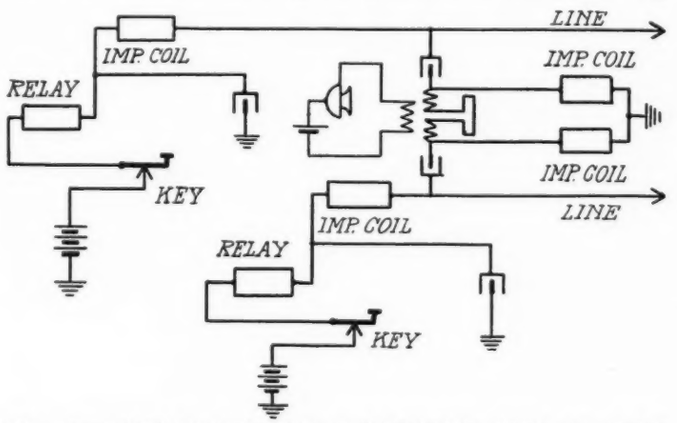


FIG. 2.—DIAGRAM SHOWING RETARDATION COILS IN TELEGRAPH CIRCUIT.

telephone current, and at the same time cause no interference with the Morse signals.

The telegraph relay is the simplest possible instrument—an electromagnet and a soft iron armature poised between two pivots and controlled by a tension spring and some arrangement for making the movement of the armature audible to the operator. The telephone apparatus is a far more complicated arrangement. I will take, for example, the set now used by the A. T. & T. Company on composite work and the common form of a telegraph relay and key combined, and as we are expected to clear trouble on these instruments after they are installed, it behooves us to get acquainted with the circuits and the scheme of wiring used, as shown in Fig. 1. We will now proceed to build a telegraph line as a by-product of a telephone line already in operation. This is a rather backward way, but it is the one circuit we are all best acquainted with.

This is a very simple arrangement and easily understood. About nine years ago I had my first experience with composite circuits, though I believe that about ten years before that time it was experimented with and used in a small way. The first circuit that I came in contact with was the making of one metallic telephone circuit and one grounded telegraph circuit out of one pair of wires. With the line and repeating coils in good order and evenly balanced there is absolutely no interference either way in this arrangement. You will observe that there is no intermediate telegraph station. There is practically no limit, however, to the number of telegraph stations at each end of this circuit; it becomes largely a question of battery pressure.

Another way of arranging this circuit is with the aid of impedance coils (sometimes called retardation or choke coils) at each end of the line in place of repeating coils.

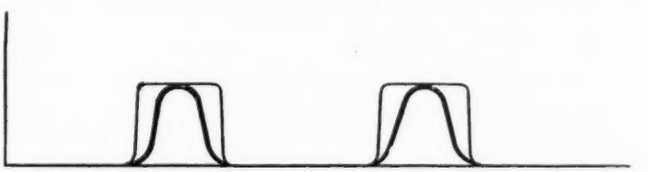


FIG. 3—TELEGRAPH WAVES INFLUENCED BY IMPEDANCE COILS

This, if the coils are properly proportioned to the circuit, should tend to improve the talking. The difficulty lies in ringing, but with a No. 8 Hayes, or one of the new 25 A repeating coils, an ordinary grounded generator, as used in our exchanges, will answer very well. With the impedance coil a circuit metallic generator would, in most cases, be necessary.

What may be termed the next move was the development of three circuits from one metallic pair, one metallic telephone circuit and two grounded telegraph circuits. We would naturally ask, what is the use of all these retardation coils? These coils, as shown in Fig. 2, are introduced into the telegraph circuit in series with it for the purpose of turning the rough edges of the telegraph waves—to flatten them out, as it were. (See Fig. 3.) They also serve to prevent the speech currents from flowing to ground through the telegraph relays, as they offer high resistance to such currents. The making of impedance and repeating coils is a science in itself, and a very difficult and important one at that.

If we did not succeed in slowing up the rises and falls of the telegraph currents the sharp or abrupt curves would be rapid enough to produce sounds in an ordinary telephone receiver. This, of course, cannot be tolerated, therefore, we change the characteristics of the telegraph currents by the introduction of elements which retard their rapid rise and fall, thereby making them inaudible in the telephone. You may ask, how do these coils obstruct the telegraph current? We know that when current is passed through coils of this description, principally because of the iron in and around it, a counter e. m. f.—an opposing force, so to speak—is set up in the coil; this force being in opposite direction to that of the impelling force, must of necessity cause delay to the

passing of the initial currents, which is exactly what is desired and what we must have in this case.

A frequency of fifteen to eighteen times per second will produce noise in an ordinary telephone receiver; therefore, we must keep our telegraph waves below that frequency. At times it becomes necessary to introduce condensers in multiple with the circuit to flatten out the waves of the telegraph current. When the key is closed the condensers become charged, which consumes time and retards the current's rapid rise. When the key is opened a discharge follows, but this discharge is opposite to the reversed flow and consequently retards its action.

The next, and by far the harder problem, is to pass ringing and talking currents over these lines. We have now a telegraph line with impedance coils in series with the line.

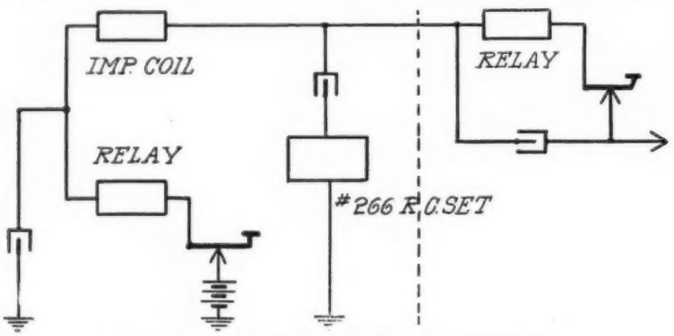


FIG. 4.—RAILWAY COMPOSITE CIRCUIT.

We know these coils offer extremely high resistance to the passing of an alternating current—the higher the frequency the more effective the coil. If we have no intermediate telegraph station we need simply to bridge our telephone instrument across the line through condensers outside of the retardation coils and all is well, excepting the ringing, as the coils will not offer resistance enough to the slow alternations of an ordinary ringing generator.

If one or more intermediate telegraph stations are placed in circuit, we proceed to shunt the telegraph relays and keys by condensers, and, if required, to introduce choke coils in series with the telegraph instruments, the whole arrangement being bridged by a large condenser capacity, if necessary. This arrangement is known as the Standard composite, and is used by the A. T. & T. Company, and a few Independent telephone and railroad companies.

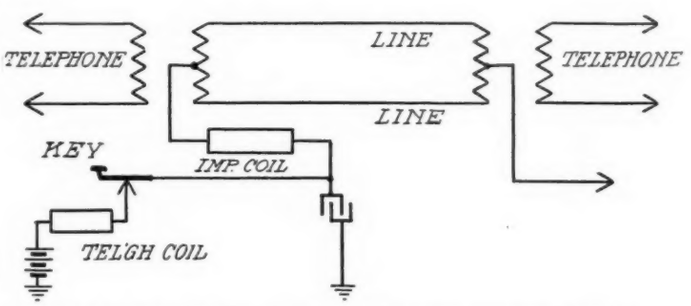
In this arrangement there might arise potential differences between the two sides of our line; these differences would then seek a path through the receiver, producing noises therein. To obviate this the receiver is bridged by the impedance coils to ground. We have now come to the most important composite circuit, the railway composite. Of late railway companies have realized the possibilities of this two-fold use of their lines and this service is being introduced more and more every day. The telegraph line arranged for composite work, such as is now commonly used by railway companies, is the most difficult of all. Let us picture in our minds an experimental line with two telephone and three telegraph stations.

The conditions of the line, the kind and size of wire, the length and kind of cable, the route chosen, etc., enter largely into our calculation when figuring on a system of this kind. The A. T. & T. Company does not, I understand, guarantee good service under all conditions on a line of this character over more than 100 miles in length, with five intermediate stations. In certain parts of Kansas, for instance, where trolley cars, street lights and rains are about equally scarce, the Rock Island people are extending their composite lines in every direction and with good results.

The dryness of the soil and climate of the state of Kansas can be best illustrated by a little story. A lightning rod man contracted with a Kansas farmer to equip his barn with lightning rods. Shortly afterward a thunderstorm came up; lightning struck the barn and the building went up in smoke. The farmer sued the lightning rod man for the cost of the rods, claiming they were useless. The judge asked the lightning rod man what was wrong with his rods—something must be the matter, as the barn burned. The lightning rod man answered that his rods were all right—the best that ever came down the pike. The trouble was with the ground connection; that it was impossible to secure good ground, and although he grounded his rods in the farmer's well, the water was so confounded hard that even the well was no good for a lightning rod ground. The judge, having been born and raised in Kansas, dismissed the case.

In Fig. 4 is shown the No. 266 railway composite set of the A. T. & T. Company. The distinguishing features of this instrument is the calling arrangement. An ordinary ringing generator has a very low frequency as compared with the talking current, about thirty-five per second, and interferes with the telegraph relays. The talking current being of high frequency and very feeble, does not affect the most sensitive telegraph relay, so we need not concern ourselves therewith. The ringing current, on the other hand, must be of as high frequency as it is possible to produce. For this purpose a circuit breaker and transformer have been devised, which, when nicely adjusted, will throw to line an alternating current of many times the frequencies of an ordinary generator.

The Illinois Central Railway Company is using a modified Standard composite on its lines between Chicago and New Orleans and Chicago and Council Bluffs, using an ordinary ringing generator with 2,500 ohm ringers, and it can signal about 300 miles. On its telegraph circuit, however, the I. C. uses 150-volt pressure and this allows a very high tension on the tension spring of the telegraph relays. A metallic generator, it seems to me, could be used with good advantage instead of a grounded one. The ringing battery used with the No. 266 set must be of the closed circuit type, about five volts e. m. f. with quite a current capacity, current flowing constantly through the slow acting relay, quite a large amount being necessary to properly saturate the ringing transformer—seven Edison Lalando cells answering very well. The transmitter battery may be ordinary dry cells, which will prove quite satisfactory. The letters C. R. C. appear on these transmitters, which stand for "composite railway circuit." It is a powerful transmitter and requires about one-half ampere to insure the best results.



METALLIC TELEGRAPH AND GROUNDED TELEPHONE LINES.

We will now proceed to trace the different circuits in this set. First, we will make an out call, by pressing the button, which closes the battery through the interrupter and primary of ringing transformer. This, in turn, sets up an alternating current in the secondary (or at least a current alternating in its nature). Thence through the back switch contact to line, returning on the other side of the line, through condensers to other side of secondary coil.

Next we will trace the incoming call circuit, commencing at binding post L through the small condenser (1-10 m. f.) through the winding of the polarized relay, through back

contact switch and also back contact of ringing key to ground binding post. This closes our local bell circuit at the slow acting relay by the fall back of the relay armature. You will observe the somewhat unusual arrangement and on the armature of the polarized relay. The opening and closing of the circuit are so rapid that the slow acting relay has no time to pick up.

The talking circuit is of the common ordinary L. B. type and requires no explanation, excepting, possibly, the impedance coil across the receiver circuit. This coil has a movable core and admits of being adjusted to suit the conditions of different lines, temporary grounds or other disturbances. When a line is in perfect condition the core is shoved clear in, if the line is noisy. Pulling out this core will tend to quiet the line by allowing more of the talking current to be shunted around the receiver. Of course, not enough of this current can be allowed to flow through the coil to seriously interfere with the hearing.

The A. T. & T. people are also providing a portable set for use in case of accidents, when a train is stalled between stations. It would be very inconvenient to carry all the battery cells necessary to generate the calling current, hence an ordinary open-circuit hand generator has been provided, the working of which will interfere with the Morse signals for the time being. There is, of course, no call bell with this, as it is used only for one way service.

FINE SHOWING MADE BY HOME TELEPHONE COMPANY OF LOUISVILLE, KY., FOR 1904.

Among the many large and successful Independent telephone companies of the United States, it is doubtful if there is one which has to its credit a finer record in all departments, for the year 1904, than the Home Telephone Company of Louisville, Kentucky, of which Col. A. L. Tétu is the general manager; and it is only fair to say that the magnificent showing made by this company is due, more than to any other cause or condition, to the tireless effort, marked ability and well-directed zeal of Colonel Tétu in his managerial position. Not content with having introduced a system into the daily working out of the company's affairs that has resulted in attaining the maximum of proficiency in the operation of the plant, he has constantly striven for even better results, and has concentrated all his efforts to this end. That success has crowned his labors is but a logical sequence. It simply goes to prove that brains, energy and purpose count in the telephone business the same as in any other walk of life.

Recently the Home company of Louisville has prepared some data for the year 1904, which shows in a most convincing manner the almost perfect operating condition of the company. Of especial interest to our readers will be the following figures which directly pertain to the operating service, namely, the total number of calls, exclusive of Sundays and holidays, in the year 1904:

1904. Months.	No. lines	No. calls peg count on 1st business day	Total No. calls for month omitting Sundays	Weather	Total No. complaints of operator's service
January	6,295	97,033	2,522,858	Clear and Cold	36
February	6,375	104,778	2,619,450	Clear and Cold	24
March	6,400	106,484	2,875,068	Fair	24
April	6,492	119,780	3,114,280	Fair	23
May	6,558	109,571	2,848,846	Fair	15
June	6,579	107,456	2,793,856	Cloudy	14
July	6,633	112,450	2,810,250	Clear	16
August	6,646	113,819	3,073,116	Cloudy	16
September	6,690	108,987	2,833,662	Cloudy	28
October	6,751	112,882	2,934,932	Fair	15
November	6,794	115,278	2,997,228	Fair	18
December	6,873	110,455	2,982,485	Clear	23
		1,318,973	34,406,031		252
Average	6,591		2,867,169		21

The busiest day of the year was on December 24, when the total number of calls was 143,811. The busiest hour was from 9 to 10 o'clock a. m. of the same day, when 12,550 calls were registered. The average number of calls per line for the day was 20+.

The figures in the above table are based upon the regular peg count record, which is maintained on the first business day of each month. Out of a total of over 34,000,000 calls, only 252 complaints of operating service for the entire year is, indeed, a marvelous record. The company claims that its 16,424 tests, made under the stop-watch, from subscribers' stations, and *answered in 38,832 seconds*, or an average of 2 1-3 seconds per call, cannot be beaten, if equaled, anywhere else in the country. The record for the year is shown in the following table:

Month.	Total No. of tests.	Total No. of seconds.	Average.
January	1,093	3,296	2 5/10
February	1,507	3,735	2 2/5
March	1,459	3,384	2 1/3
April	1,414	3,065	2 1/6
May	1,409	3,064	2 1/6
June	1,235	2,910	2 1/3
July	1,023	2,275	2 1/4
August	1,202	2,803	2 1/3
September	1,397	3,283	2 1/3
October	1,270	3,061	2 1/2
November	1,818	4,146	2 1/4
December	1,597	3,810	2 3/8
	16,424	38,832	2 1/3

The following table shows the cases of switchboard trouble for the year in all the various departments of the board:

1904.	Tested O. K.	Cord.	Plug.	Key.	Relay.	Multiple.	Receiver Cords.	Transmitter.	Lamp.	Total.
January	43	55	84	86	123	90	27	28	28	564
February	47	63	118	83	91	27	35	5	27	496
March	91	43	88	79	129	21	31	4	39	515
April	78	51	54	62	76	8	49	7	14	399
May	60	33	38	103	100	19	33	8	27	420
June	86	38	61	80	169	10	42	6	29	521
July	56	37	41	61	227	23	25	6	21	497
August	79	48	66	72	233	8	41	5	30	582
September	80	47	42	117	235	12	54	3	38	628
October	86	58	29	73	195	21	61	5	32	560
November	88	55	26	77	160	14	57	4	21	502
December	110	31	48	61	130	22	51	5	8	466

We should be glad to hear from other operating companies, with data on operating, as it shows the marked progress of Independents in the matter of service to subscribers.

DISCARDS BELL SERVICE.

The Pittsburg & Allegheny Telephone Company has contracted for practically all the telephones in the works of the Carnegie Steel Company, at Homestead, eight miles above Pittsburg on the Monongahela river. A total of 183 telephones have thus been transferred from the Bell to the Pittsburg & Allegheny service and will stay there for at least five years, according to the contract. The Central District Printing & Telegraph Company, the Bell company in Pittsburg, has thus lost all but six of its telephones in these works. It will take 12,000 feet of telephone cable in addition to the wires to equip the plant. The Pittsburg & Allegheny Company now controls the service in the Carnegie plants at Duquesne, where it replaced the Bell service over a year ago, and also has the Carnegie works at Youngstown, Warren and Niles, Ohio, and Sharon, Pennsylvania, in addition to several of the Carnegie plants in Pittsburg. Private exchanges have been installed in all these plants. This gives the Pittsburg & Allegheny Company practically all the Carnegie plants except those at Monessen and Donora, Pennsylvania, which have twelve and fourteen telephones, respectively.

QUESTIONS AND ANSWERS

Conducted by J. C. Kelsey, Purdue University, Lafayette, Indiana.

There is a 2,000-volt alternating lighting system in our city. The primary wires pass through trees in many places, and our telephone wires also pass through these same trees. I want to ask several questions: First, supposing that the alternating system was perfectly insulated and that a person standing on the ground should touch one of these primary wires. Would he receive a disastrous shock? And, if so, how would his body receive this current when this current had no path to flow? I have always understood that current had to have a path to flow—that is, one of these primary wires would have to be grounded before a person could get a shock from the other wire. Second, supposing that the bare telephone wire touch a limb of the tree—the same limb which the primary wire touches, which is bare also at this point. Would the telephone wire be charged to the voltage of the primary wire, through contact with the wood? In all probability, what charge would the telephone wire attain, four inches from the primary wire, in dry, wet and damp weather? Would it be enough to kill a man working on the wires? Third, supposing that the primary wire came within a quarter inch of the telephone wire, without actually touching it, would it be possible for the telephone wire to receive any kind of charge from the primary wire?—J. M. D., N. W.

I consider this a very important question. We all know that it is more dangerous to be a telephone lineman, than a lineman on a trolley or lighting system. It is because the telephone lineman usually works under conditions that involve no direct hazard. I mean by this, that he is safe from shocks, if the telephone system is the only wire system in the place. So the telephone lineman works along, one might say, carelessly. If a wire should come into contact with a power or lighting wire at some unknown place, the worker would not be aware of it, and only good luck would save him. The lighting lineman knows that he is handling dangerous conditions, and is alert and suspicious of danger. Even though working on a part of the system in disuse, he knows that without warning, a current is liable to be put on the wires. Always taking precaution, he wards off the danger unconsciously. The arc lamp trimmer, although he knows that the circuit upon which he is working is idle, takes the same precautions necessary, if he knew the current was turned on.

The question of touching the bare primary wire of a purely insulated system is a natural one. Most men will say that a ground on the primary wire would be necessary. But that is not true. It would be true in case of direct currents. If the static charge could be drawn off the direct current wire, the person could handle the wire with safety, although standing on the ground. It is hard to assume that a line is well insulated throughout, but usually it is not. There is a leak at every insulator and at every tree contact. But assuming an insulated circuit, the man who touches the bare wire of the alternating system of 2,000 volts would undoubtedly be killed, because the current would pass down to earth through his body, and thence back to the other wire through the air—that is to say, the capacity of the wire and earth condenser. This actual tangible current will flow, and a person would be subjected to the fullest pressure of the generator. When alternating currents are considered, then capacity takes part. We all know that current will pass through a condenser. We ring bells through condensers, and we talk through condensers. Why, then, will not current from a 2,000-volt alternating circuit at 60 cycles frequency, pass through capacity also? It will, undoubtedly. The capacity of a wire twenty-five feet above the ground is about .015 microfarads per mile. The average lighting circuit is three or four miles long, anyway. Then the capacity is about one-fifteenth of a microfarad. To one who would doubt that current would pass through a one-fifteenth microfarad condenser at 2,000 volts, can easily prove that it will pass current enough to hurt at 100 volts.

With direct currents it is different. Touching the bare wire would give one a heavy shock, static only. If this charge could be withdrawn without passing through the body, no more current would pass from the primary wire. Capacity has no effect when direct current is used. However, I don't advise anyone to work on commercial direct current circuits with the idea of safety.

The second question: Supposing both bare telephone wire and bare primary wire touched the same tree limb. If the wires touched metallically, then the telephone wire would be of same characteristics as the primary wire, and would be dangerous for persons to touch when standing on the ground. If separated by three or four inches, the charge transmitted to the telephone wire would be very feeble. With the normal limb the potential of the telephone wire would not be advanced ten volts by the limb contacts. If there is a heavy rain, the chances are that the potential of the telephone wire might be raised several more volts. If one reads the static voltmeter at the central station, the wettest night will reveal more than 300 or 400 volts leak, and this indicates not one wet cross, but great numbers of them. If it could be assumed that a wet tree could carry the full force of current, it is not hard to see that every rainstorm would completely short-circuit a power station. That is not true, for such a condition never obtains. It is safe to say that the charge transmitted to a telephone wire which was touching a limb four inches from a primary 2,000-volt wire, even in the wettest weather, would not possibly tranmit enough charge to kill a man working on the telephone line. There could exist a pressure, enough for the man to feel, possibly, but that is doubtful.

In the third question, without actual contact, the charge cannot be transmitted that distance, one-quarter inch. With the full pressure of the 2,000-volt generator, it could not be done.

When one considers that even a small town has two telephone systems, two telegraph systems, a fire alarm system, an electric light system, and a trolley and feeder system, the question of safety assumes an important aspect. For myself I have seen too many linemen killed, especially telephone linemen, and the question of proving negligence, both from the man's standpoint, and the company's standpoint, is certainly worth consideration.

As an effective and economical underground system for a small town, with no trolley system, would you think the following method advisable? Dig a trench the width of a spade, and from twelve to fifteen inches deep, in the street close to the curb, or rather partially under the curb; make a trough of cheap strips of lumber, so as to allow one inch or more around the cable or cables, then after placing the box in the ditch run the cables in it. Then pour the box full of hot pitch, let harden, then fill in dirt and tamp up. Of course, the cable is to run to a distributing box on the pole at the end, same as is used in an ordinary conduit system. How long

would this conduit last? And would you consider it a good plan?—G. W. L., E. W.

The method described is all right. It seems to me that it would do just as well to lay the cable in a ditch and cover it with a heavy plank, so that future trench diggers, for drain, etc., would not drive a pick through it. I know of one big company that took care of a branch office, with one mile of cable buried in a shallow ditch, and never had any trouble. Laying the cable in the ground would possibly cause chemical action, to the detriment of the cable sheath, and this is where the pitch would help. I believe it would be preferable and cheaper, too, to put in some fibre conduit, and thereby protect the cable from earth contact. You may want to pull out the cable sometime, to renew it or look for some trouble. On the whole, I think your idea is a good one.

How much current will flow through a circuit, consisting of a two microfarad condenser and a thousand ohm bell, from a sixty cycle alternating current of 5,000 volts?—Cal.

According to formula, the current C is equal to the pressure, 5,000 volts, divided by the square root of resistance squared plus

$$\left(2\pi f L \text{ minus } \frac{1}{2\pi f C}\right)^2 \quad \text{or} \quad C = \frac{5000}{\sqrt{R^2 + \left(2\pi f L - \frac{1}{2\pi f C}\right)^2}}$$

The resistance R is 1,000 ohms. The expression

$$C = \frac{5000}{\sqrt{1000000 + (3393 - 1326)^2}} = \frac{5000}{\sqrt{1{,}000{,}000 + 4272\ 489}}$$

$$= \frac{5000}{\sqrt{5,\ 272.\ 489}} = \frac{5000}{2296} = 2 + \text{amperes.}$$

377, while L, the inductance is equal to 9, measured in henries. The capacity is .000002 farads.

The chances are, in such a circuit, that the high pressure would destroy the ordinary condenser, and would be likely to puncture the ringer coils also. To force two amperes through a two microfarad condenser would involve an electrical stress, which the condenser could not resist. A 500-volt circuit will break down a condenser, because the dilectric is too thin. I have assumed the 1,000-ohm bell to have an inductance of nine henries, which may be high. The average clearing-out drop has about that inductance. The bell can be taken at less.

I notice, in looking over a patent No. 777,544, granted to J. C. Roberts, that one side of the line is permanently attached to the battery, without going to the multiple. Some time ago I wrote you and inquired if a switchboard made in this manner would work satisfactorily, and I was advised by you that such a circuit would be unbalanced and subject to cross-talk. What I would like to know is this: Is this circuit practical, and, if not, what object would the X company have in having it patented? If this system works all right, as it appears on the sketch, I have perhaps gotten the principle wrong. Please advise me.—R. J., Ohio.

Not being familiar with the patent in question, I cannot go into detail. It is certain that Mr. Robert's circuit will work. However, a general proposition can be laid down, which is that all metallic circuits should be separated from the battery by equal impedances, so that the circuit will be individualized and balanced. There are numerous localities, where circuits connected directly to one side of the battery will work properly, and without noise due to unbalance. But it is a sure thing that if common battery circuits are connected directly to one side of the battery, there will be some cross-talk. On short lines there would not be, as may be noticed in a common battery, operator's circuit. Here the transmitter is connected to the battery in series with an impedance. The cross-talk is not noticeable as the circuit is short. But I know from experience that long lines tied to the same battery side will surely suffer from cross-talk. The amount may be small and unnoticeable, but it can be found if looked for. In many small towns, the unbalanced condition will not show, as there is no disturbance to take advantage of unbalance.

MANIFOLD USES OF THE TELEPHONE.

In meeting the wants of all their patrons, some telephone companies have established exchanges among foreign speaking peoples. In the Chinese quarter of a western city there is a telephone exchange with over five hundred subscribers. The Morse code used in telegraphing will not transmit Chinese, a language written in a peculiar alphabet of its own. When a Chinaman sends a telegram in Chinese it must first be translated, then sent over the wires, and translated again into Chinese, but over the telephone wire the Chinaman may talk in his own way, and he has been quick to avail himself of the opportunity.

The use of the telephone in the cities finds something of a parallel in its use by farmers who are able to secure the weather predictions that they may know when to sow and to reap, and also keep in touch with the markets that they may sell their products to the best advantage. No class of people in the United States is more greatly or more directly benefited by the telephone than the farmer, and the advent of the Independent movement into the rural districts has proven a god-send to him in countless ways.

The long-distance service of the Independent companies is becoming more and more a factor in business life, and in ways which only a few years ago were unknown, and which are still among the novelties of telephony. The long-distance telephone is one of the greatest of time savers. An illustration is found in the case of a man who, having been taken ill when about to start on a journey, telephoned to the people whom he had intended to see in half a dozen cities, and transacted his business so successfully that his proposed trip was not necessary. By a few hours' use of the long-distance lines he saved several hundred dollars in money and a week's time.

The long-distance telephone is of assistance to the mariner. The captain of the coastwise steamer bound to a city a hundred miles from his sailing point calls up the local weather bureau at his destination, and often receives information which, in connection with the regular predictions, is of assistance to him in determining whether he shall put to sea or remain in port.

Both in long-distance and local business, Independent telephone companies give the American people a telephone service which is available for use by everybody, and is at the same time adapted to the special needs of any class of patrons. That the American people appreciate the benefits brought about by competition is shown by the steady growth that the Independents have enjoyed since the inception of the movement and are experiencing at the present time in a greater degree than ever before.

TELEPHONE WAR IS EXPECTED.

Port Byron, New York, promises to be the center of a lively telephone war between the Bell and the Independent interests. For years the Bell people have had the only service available. The new Port Byron company is already an assured success. The directors are canvassing not only in Port Byron, but Throop, Montezuma, Conquest, Spring Lake and Emerson.

To meet this threatened invasion the Empire State Telephone (Bell) Company has started out on a systematic canvass of that territory, promising to build rural lines and to give cheap rentals, but the farmers believe that they can build and operate their own lines cheaper than they can hire.

A large delegation representing the directors of the new Independent company recently went over to Emerson and the trip resulted in enough new subscribers to build the line to Emerson and Conquest. The Port Byron Company stands ready to build to Weedsport and establish an exchange there in opposition to the old company.

Concerning Telephone Switchboards

SAMUEL G. McMEEN

TELEPHONE switchboards involving the use of incandescent lamp and electromagnetic visual signals for announcing the making of a call and for indicating the progress of the conversation have been described in other stories under this title, and so far as any of these referred to the equipments which have been installed in a large degree and operated with economy and success by the licensees of the Bell Telephone Company, they have referred to the simpler and less costly forms used in the small and medium-sized exchanges.

Considering as a whole the exchange equipments of the company referred to, the installations of switchboards of

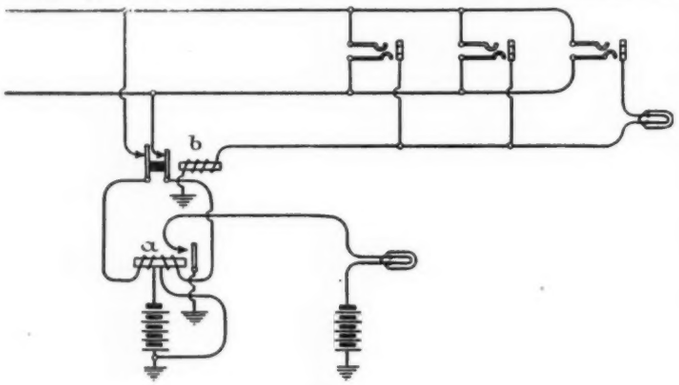


FIG. 1.

the types already described care for a relatively small portion of the lines. The type of common battery equipment which may be called the standard of the Bell Company has these features of visual signals for the line and supervisory purposes, but involves a larger expenditure of power per conversation and a larger investment cost per line in the beginning.

The earliest use of visual signals in connection with lines and cord circuits in a switchboard serving substation not equipped with magneto bells was in San Francisco ten years or so ago. Incidental to this commercial—yet in a broad way experimental—use, were the features of no multiple of the subscribers' lines, and a system of local trunking. Because of distinct gains in speed by virtue of these and other features, the system was likened to railway service by limited express, and the term "express system" was applied to the arrangement and has survived. Frequent and more or less exhaustive studies of the San Francisco application were made by interested persons, and the analyses seemed to show that the character of the service was improved and the cost of making it diminished, the standard for comparison being the previous grade and cost of service made with equipment involving magneto bells and self-restoring drop switchboards.

As the express system involved the two elements of automatic signals and local trunking, it was not immediately concluded which of these elements deserved the most of the credit for the results obtained. In time, however, it became an opinion that the automatic character of the signals and the elimination of uncertainty of supervision so gained were deserving of most of the credit of the improvement. Assuming that the cost of the multiple jack portion of a multiple switchboard might be expected to decrease with improvements in the art and the expiration of patents, it was concluded that a multiple switchboard, with its economy of labor cost due to the absence of trunking, would be the ideal device to which to add visual line and supervisory signals.

A switchboard involving these features, but not those of central supply for substation transmitter currents, was installed in Worcester, Massachusetts, in 1896. As it had been proved by an experimental installation in an office in Market street, Philadelphia, that operators can assist each other by proper team work in a marked degree, it was expected of the Worcester installation that a considerable increase in capacity per position and a considerable improvement in quality of service would be obtained.

The results were not out of agreement with the expectation. Indeed, it may be said that the Worcester trial represents the advent of the form of central office equipment which remains to-day the highest type of manual mechanism. But the Worcester equipment is like the apparatus which succeeded it and is still a standard type, in design rather than in detail, for the existence of a permanently bridged line relay and the absence of special supervisory signal control introduce as many objectionable as admirable qualities. To keep the line circuit wholly free from grounds or bridges from the cord circuit to the exit of the line from the central office is an advantage not lightly to be disregarded. Similarly, to be compelled to exercise a somewhat exquisite care in the manufacture and choice of signal lamps is not wholly convenient.

The standard relay board, which this article discusses, allows a wide latitude in lamp margins, and provides signal circuits which are not electrically connected with the line itself. If Fig. 1 be scrutinized with the talking line prominently in mind, it will be seen that under normal conditions the line relay *a* is in series with the battery, and both are a bridge upon the line. But on the assumption that the cut-off relay *b* is energized, the line will be seen to be cleared of any bridge at all except such as will be established by the cord circuit which operated the cut-off relay.

It is true that the circuit requires three conductors through the multiple jacks and three in the cord circuit, as shown in Fig. 2, and it has been contended, and may be possible to be proved, that there are economies in eliminat-

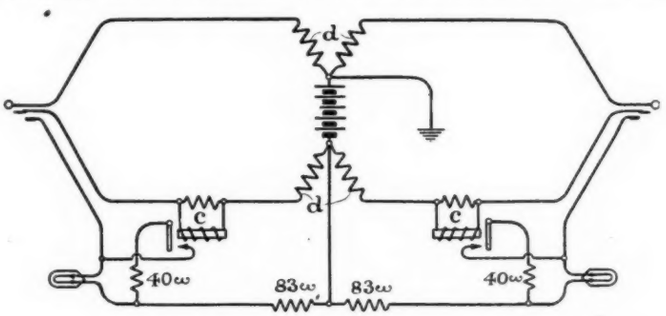


FIG. 2.

ing the third conductor. The contention would seem to be that of three conductors on the one hand against line bridges on the other, and in the absence of a recognized standard of transmission and very accurate data as to costs, the question may not be disposed of by any sweeping declaration. It may be said, however, that it is quite evident that the costs of equipment items must decrease rather than increase, and that so long as the continents are greater in extent than the maximum reaching power of transmission, there would

seem to be little wisdom in sacrificing any small fraction of line efficiency.

It may be responded that a relay or other winding of high impedance is opaque to voice currents. That this statement is general rather than absolute is easily determined by listening in a receiver which is receiving voice currents in series with a bridging bell.

The typical line circuit, shown in Fig. 1, will be noted to have a line relay *a* of two windings. Many installations of this type have line relays of but a single winding, this being connected between the battery and that wire of the line which joins the long springs of the jacks. Such installations have line relays of approximately 100 ohms and the click heard upon the response of the operator is rather more vicious than is pleasant. It has been found that a line relay of a higher resistance, having two windings, one in each limb of the bridge, reduces this click in a pleasing degree. In practice, the resistance of each winding is 1,000 ohms. The coil in series between the battery and the long-spring limb of the line is all of copper, while the other contains turns of a higher resistance metal and fewer of them.

If the student will take the trouble to consider Figs. 1 and

FIG. 3.

2 in relation to each other, and imagine the plug to be inserted in a jack of the line, he will see that the first action is to operate the cut-off relay and that if the elements of the circuits are properly dimensioned, the cut-off relay *b* will remain energized during all the time the plug is in the jack. Current for this holding comes from the battery in the cord circuit of Fig. 2. It is to be noted that this is the same battery as that which energizes the line relay in Fig. 1. If the plug be in the line of a station whose hook is down, current will flow through the resistance of eight-three ohms and the supervisory lamp in the cord circuit, thence over the third wire of the line and to hold the cut-off relay. If the latter gets current at all, it must get this amount, which, with a lamp resistance of 120 ohms, and a voltage of twenty-four, will be about one-tenth of an ampere.

If, however, the substation hook is up, current will flow in the line, the supervisory relay *c* will be energized, and a shunt of forty ohms placed about the lamp. With a lamp of the proportions indicated, its signal will be extinguished during all the time this shunt remains about it. Current through the cut-off relay, however, will not be diminished, but rather increased, and it is this feature more than any other which causes the standard Bell relay system to consume large quantities of current.

It is interesting to note that the current supplied through the repeating coil to the substation transmitter passes through a relay which would be directly in series with the conductor leading to the ring strand of the plug, were it not for the existence of a non-inductive shunt about that relay winding. Neither the inductive winding of the relay nor the shunt about it is of high resistance, and the joint resistance of the two in parallel is but about ten ohms. On the longest lines the contact closing the forty ohms shunt about the lamp is not made with great power, but if the relay closes at all it may be depended upon to extinguish the lamp.

The repeating coil referred to as forming an element of the cord circuit is shown in a usual and conventional way in Fig. 2 as composed of the windings lettered *d*. These are associated together in connection with one or two magnetic circuits and require to have the two important qualities of furnishing a sufficient current to the subscriber's transmitter and of transforming the variations of current in one pair of windings into a variable current in the other. In all the earlier installations these repeating coils were of a type wound on a straight round core, with iron ends and an iron cover. It is a tendency of recent times to equip such cord circuits with repeating coils formed somewhat after the manner of Fig. 3, in which the core is a ring formed of fine wires insulated with a non-fibrous covering. The windings upon the core are disposed, so far as the circuits concerned, as shown in the figure.

When it is considered that the test bushings of a line are normally at earth potential, as is also the tip of a plug which is not in a jack, it will be seen that the requirements of busy test are provided, and that when a plug tip touches the bushing of a busy line, current will flow in the repeating coil. This may be made audible to the operator in a variety of ways, the simplest of which is to bridge the receiver across the talking conductors of the cord circuit. In practice, a condenser is in series with this bridge.

As the test conductor is wholly disconnected from the line at all times of conversation, it is feasible to place upon it a variety of currents, all of which may signify that the line is busy, but which by their differences may signify that and something more. An example of this sort of special guarding is the placing of a tone upon the test conductor of a line which is out of order, so that upon testing it the operator may inform the subscriber that the line is under repair and thus save him fruitless busy calls.

Another interesting example of a special test is the placing of a tone upon the test bushings by the insertion of the plug of a circuit leading to an operator who writes toll tickets for subscribers. This tone may mean to all subscribers' operators merely that the line is busy, while it may mean to a trunk operator who puts up toll connections that although there is a connection on that subscriber's line it may be taken with impunity upon call from the toll operator. The freedom of the test wire from electrical connection with the line proper is of further advantage in the operation of certain forms of toll meters. These are devices adapted to be associated one with each line in such a way that the operator may cause the meter of a line to count one whenever a conversation originated by that line has been completed. Wherever the meters may be located, one terminal of the winding is connected to ground and the other by a single wire to the test conductor of its line. If, therefore, upon the completion of the conversation which is to be charged for, the operator presses a key which will put a higher potential than normal upon the test bushing, the meter, if properly designed, may be made to count, the cut-off relay for the moment carrying a considerable excess of current.

A comparison of the relative simplicities of accomplishing tone test and meter results along these lines with two-wire and three-wire line and cord circuits, will show, it would seem, that cleaner and simpler results will come from the use of the three-wire circuits. The ingenuity of inventors, however, seems to be equal to most emergencies on all these lines, and it is unlikely that a method can not be found for harmonizing toll counting systems with the advantages of two-strand line and cord circuits.

Bondville, Illinois, has a real prodigy in little Elmer J. Holland, only seven years old, who is probably the youngest and smallest telephone exchange operator in the country. The telephone exchange is located in his father's barber shop, and for more than a year the little lad has been attending to it while his father was busy.

The Telephone in Foreign Countries

TELEPHONIC CONDITIONS IN FRANCE.

THERE has been very serious dissatisfaction with the conditions of government telephony in France, and an Association of Telephone Subscribers has been formed. It has a growing membership, including between 4,000 and 5,000 of the Paris telephone subscribers. Since July of last year a monthly bulletin has been published by it containing articles and reports on the various aspects of the telephone question in France. With a view to acquiring thorough information on the technical side of the telephone service, the association recently retained Herber Laws Webb of London, and formerly of New York, as consulting engineer. That well-known expert has furnished the association with a report on the general conditions of a modern telephone system and with a further report on the principal causes of the defective service in Paris.

Mr. Webb's first report contains a well-written popular description of the central battery system, as at present employed in the most modern exchanges. As Mr. Webb has not been allowed to visit the exchanges, his second report is based on general knowledge of the Paris telephone service acquired from public descriptions and from observations made on visits to Paris during the past few years. He divides telephone exchange working into three periods. During the first period, from 1880 to 1890 or 1892, the methods in use were largely experimental. During the second period of another five or six years, the development of telephonic apparatus was more scientific, while during the last period effective methods and apparatus have been perfected and standardized.

The Paris system has largely remained in the first period, having only adopted some improvements belonging to the second period mentioned, and being "entirely innocent" of the apparatus and methods of the third period dating from 1897. While these older methods may still be suitable for small exchanges, they should not be applied to larger systems, and, moreover, owing to the defective working of antiquated apparatus, the nerves of the operators are so taxed that it is unreasonable to expect a high standard of efficiency and discipline from these ladies.

Mr. Webb next criticizes the peculiar practice of the French telephone department in compelling each subscriber to supply his own telephone set, with the result that there are various types in existence, some having radical technical defects. The variety of instruments also makes it impossible to train a force of inspectors to familiarity with the peculiarities of all the numerous types. A further evil is the extensive use of primary batteries instead of magnetos or a central battery for signaling. The cure suggested is the reconstruction of the whole system on modern lines, which would occupy two or three years. Mr. Webb does not give an actual estimate of the cost of the conversion, but is of the opinion that it would be "far less than the cost of a single battleship, and even less than the cost of an armored cruiser, and well worth the price."

In Paris the total number of telephones is about 45,000, and there is a yearly increase of about 3,600 subscribers. In New York, which has a somewhat smaller population than Paris, there is a telephone system serving over 150,000 telephones and increasing at the rate of 30,000 per year. The flat rate of charging in Paris should be abolished, says Mr. Webb, and with a scientifically arranged message-rate tariff he thinks it would be possible to reduce the minimum basis charge to $30 per annum. If this were done, he concludes, and an active business policy were adopted, Paris would have in five years 150,000 telephones, and in ten years 250,000 or 300,000 telephones.

VICTORY FOR LONDON "HELLO GIRLS."

A "special" from London says: "A sartorial triumph scored by the National Union of Telephone Operators has caused much jubilation among the many women employed at the various exchanges of the National Telephone Company. For many years the girls have resented the stern official decree which placed a veto on the wearing of all the little fal-de-lals dear to the feminine heart. The taste of the company in matters sartorial—so the young women declared—left much to be desired. The wearing of a string of beads involved the entry of the wearer's name in a black-book devoted to the misdeeds of recalcitrant exchange girls. The appearance of a colored comb in the hair was an enormity punishable with a fine, while young women who dared to wear colored blouses had to submit to the ignominy of wearing an ugly black overall.

"But the telephone girls determined to change all this. Five months ago the National Union of Telephone Operators was found, and one of the items on the programme of the fair trade unionists was the abolition of these vexatious regulations. Last week, after a voluminous correspondence had passed between the girls and the company, the latter agreed to suspend all rules against dresses and ornaments for six months. The exchange girls may now deck themselves out in the full glory of colored beads and combs, but if they abuse the new-found privilege there will be a return to the old regime at the end of six months."

BUDAPEST'S TELEPHONE NEWSPAPER.

Budapest has a newspaper that always "scoops" its rivals and is able to issue an extra literally on a minute's notice. The name of this unique journal is "Telefon-Hirmondo," the telephone newspaper. Having been in existence for over ten years, it has ceased to be an experiment. The news is gathred and handled precisely as in the office of an ordinary newspaper, except that instead of putting the type into forms for the press galley proofs are given to six stentors, with strong clear, distinct voices, who speak the news into receivers connected with wires leading to the home and business places of subscribers, of whom there are 6,200.

A complete programme is tacked to the wall above each subscriber's receiver, so that he can tell at a glance what department of news is to be expected at any hour, every day except Sundays and holidays having the same programme. The issue begins at 10:30 a. m., and ends about 10:30 p. m., unless a concert at some late-at-night event is to be reported. The Stock Exchange reports reach subscribers several hours ahead of the evening papers. At 1:30 and 6 p. m. comes a resume for those who have missed the earlier news. From 5 to 6 there are concerts, varied by literary criticisms, sporting news and so on. Special items for Sunday are: 11 to 11:30, news; 1:30 to 6, a concert. On Thursday evening at 6 comes a concert for children.

To facilitate the service the city is divided into twenty-seven districts, with a main wire to each district and branch wires into the houses. An accurate map of the system hangs in the office. The company owns its own wires and plant and has the same right to place wires enjoyed by the tele-

phone and telegraph companies. Twenty-seven copper wires run from microphone receivers at the opera house to the central office. There the current passes through a patent device which increases the sound, its distribution to subscribers also being regulated by an ingenious patent device.

It might be inferred that such a newspaper would be costly to its patrons. As a matter of fact, each of the 6,200 subscribers pay about $7.50 a year, or a trifle over two cents a day. The paper carries a fair amount of advertising. It is always able to guarantee that the "ads" will appear "next to reading matter," for the "ads" are sent over the wires between items of news, and the stentors are particular to enunciate the "ads" in such a way as to make them attractive. Instead of using display type, this paper uses display tones, and a stentor who knows his business can fairly make people believe they want the articles advertised.

The expenses of the newspaper are about $45,000 a year, while its receipts from subscribers are nearly $47,000 a year. As the advertising, at the rate of 42 cents for 12 seconds of space, amounts to a small fortune in the course of a year, it will be seen that the company is paying dividends on its capital stock of $250,000. The company expects to have sufficient surplus soon to warrant a reduction in the cost to subscribers.

THE TELEPHONE IN MEXICO.

The Mexican Telephone Company reports to headquarters in Boston for October as follows:

	1904.	1903.
Gross earnings	$24,931	$22,923
Operating expenses	14,336	12,244
Net earnings	$10,595	$10,679

Showing a decrease of $84 in the net earnings of last October.
From March 31 to October 31:

	1904.	1903.
Gross earnings	$196,933	$181,873
Operating expenses	109,375	92,364
Net earnings	$ 87,558	$ 89,509

The above report showed a decrease in the eight months of $1,951 in the net earnings.

On March 1, 1904, the number of subscribers was 5,076, against 4,791 in March, 1903, showing a gain of 285; the gain since March, 1904, is 172 subscribers.

One of the largest private telephone systems to be constructed in Mexico is to be installed on the ranches of William Richardson, who is said to be the largest landowner in northern Mexico. He has awarded the contract for building about 100 miles of telephone lines to connect his different properties to the firm of Van Vorhis Brothers of Monterey. The central office for this large private system will be at Carmen, the headquarters ranch of Mr. Richardson.

The Mexican Telephone Company is to be reorganized, to the end of putting it on a paying basis.

A long-distance telephone connecting the three important and progressive towns of Gomez Palacio, Lerdo and Torreon has just been inaugurated. Lerdo and Gomez Palacio are also connected by telephone with Durango, the state capital.

The state of Sinaloa, in Mexico, through Governor Canedo, has granted an important concession to the Culiacan Electric Company, composed of Americans, which was recently organized with a capital stock of $300,000, for the construction and operation of long-distance telephone lines throughout the state and the establishment of local telephone exchanges at Culiacan and Mazatlan.

The work of constructing a telephone line between San Luis Potosi and San Felipe has been completed.

T. F. Maguire, general manager of the Mexican Telephone Company, says that the work of placing the telephone cables in the City of Mexico underground will be commenced some time this month. It is stated that the plan of the proposed underground system calls for an ultimate accommodation of 10,000 subscribers. A new switchboard will be installed in the company's headquarters on Calle del Arco de San Augustin, where its entire central plant was recently placed. The switchboard at present in this building is only temporary and will be shipped back to Chicago, where it was obtained, as soon as arrangements have been made for the installation of the new one.

A new telephone line has just been built between the towns of Tlazazalco and Pureparo, state of Michoacan, Mexico.

A telephone line has been built and placed in operation between San Luis Potosi and the town of Villa de Arriaga, Mexico.

FIRE AT THE LONDON WALL TELEPHONE EXCHANGE.

Twice within three years the London Wall telephone exchange has been put completely out of service by fire. The first occasion was on July 9, 1902, and the second only a fortnight ago. Although the property is fully insured, there are some things which no amount of insurance can cover, and the National Telephone Company doubtless has the sympathy of telephone engineers in general, says the London Electrician. To this sympathy must be added congratulations on the speed with which normal conditions of working were restored. On the first occasion it took about sixteen days to renew the service to all subscribers; on this second occasion it took rather less than the same number of hours. This was possible only because the circumstances were exceptionally propitious.

When the 1902 fire occurred, a new exchange was being built at Holborn, and therefore it was comparatively easy to transfer all the apparatus to London Wall. By a stroke of great good fortune, the new exchange built to replace the old London Wall exchange was nearly completed at the time of the recent fire, and it was intended to transfer the operators from the temporary exchange alongside it to the new building in about a month's time. It was with this intent that the work was being carried on when the fire occurred and the company then had to do in a night what it had anticipated doing in a month.

The circumstances that attended the outbreak were as follows: At about 6:05 p. m. one of the supervisors in the old exchange noticed flames issuing from the test room, and with commendable promptitude told the operators to leave the building quickly, but quietly. She then sounded the fire alarm, and every operator was out of the building and in safety at Salisbury House—on the other side of the road—in the space of a few minutes. By this time the test room resembled a roaring furnace, but the fire brigade was quickly on the scene, and soon got the fire well in hand.

From the present appearance of the test room it seems almost miraculous that the outbreak was prevented from spreading further, as there is only a lath and plaster ceiling, and some of the cables in the next room were severely scorched. The new and old test rooms were connected by temporary cables and when the fire broke out these were cut off and the insulating pegs in the new test jacks removed. Unfortunately, however, the water ran down the temporary cables and thoroughly wetted a large amount of apparatus in the new test room. This had to be dried by means of dry-air pumps and braziers before testing could be commenced. Eventually, however, every line was tested both inside the exchange and outside, and although the task of making the new connections was only commenced at 7:30 p. m., all the subscribers and junction lines, with a very few exceptions, were connected up to the new switchboard in working order by 9:30 the next morning. The magnitude of the work may be gauged from the fact that

there are 3,819 subscribers, 1,060 junctions and 1,080 through connections of the London Wall exchange. In addition, there were also forty-nine other metropolitan exchanges at which tests and alterations had to be made, owing to the change from the magneto to the common battery system. The remarkably rapid change-over could not have been effected in the time if it had not been for the untiring energy of every one of the company's employes. From the highest official to the humblest workman all worked with hardly a pause.

TELEPHONY IN CANADA.

Commenting upon the telephone situation in Manitoba the Montreal Gazette says: "The Manitoba legislature has slaughtered a couple of bills creating Independent telephone companies, on the recommendation of a committee which pronounced in favor of government ownership. The committee looked to Great Britain for encouragement and found it in the fact that the British government some time ago took over the long-distance lines of the National Telephone Company. If the committee had gone a little further in its investigations it would have learned that these lines were taken over only for the purpose of preventing their interfering with the receipts of another state-owned monopoly, the telegraphs, a monopoly which is and has always been operated at a loss, and which loss the competition of the telephones, left unhampered in the control of a private corporation, threatened to seriously increase. The telephone situation in Great Britain affords no encouragement to the state-ownership fad."

The Manitoba government has decided to go into governmental ownerships of telephones, and will appoint a commission to inquire into the system now in operation in the province, with the view of buying out the Bell Telephone Company, or constructing a new system of its own.

N. D. Neill of Brantford, Ontario, president of the American Machine Telephone Company, announces that the company has sold its American rights to the Lorimer Telephone Company, an organization capitalized at $10,000,000. The company retains its Canadian rights and is seeking a franchise in Brantford.

A Petersborough dispatch says that the work of installing the underground cables of the Canadian Machine Telephone Company has begun under the supervision of P. Nevill, Canadian superintendent of the Standard Underground Cable Company.

TELEPHONING ON THE CONGO.

The telegraph and telephone lines of the Belgian Congo region show some peculiarities both in the construction of the lines and their operation, owing to the climate and the character of the country. Where the lines run through the forests, the wires are placed as much as possible upon trees and in other cases upon iron poles. The wire, which is of phosphor-bronze, is painted black, so as not to attract the attention of the natives, who lay hands upon all the copper they can find. The other brilliant objects of the line, such as the insulators, are also painted black. A cutting thirty feet wide is made through the forest for the line, so that there is no risk of fire or from falling trees.

Besides the telegraph offices of Lenpoldville, Kwamouth and Coquithatville, there are nine telephone offices and six cabins. The latter are used for communicating with the steamboats on the river.

The first hours after sunset are the best for telephoning, and it is possible to telephone direct from Matada to Kwamouth, or 380 miles. From the latter point to Boma, or 410 miles, the voice is still heard. After 10 o'clock a. m. the heat makes it impossible to use the telephone, especially in the rainy season. This is due to the fact that a return wire is not used, and the use of the earth return is accompanied by great disturbances in the middle of the day.

The greatest enemies of the telephone lines are the wild animals. In the rainy season atmospheric discharges often strike the wires, therefore the lines need to be constantly inspected and repaired.

TELEPHONIC PROGRESS IN LONDON.

Great progress continues to characterize the postoffice telephone service in the metropolitan area, says the London Standard. It is not three years ago that the Central exchange was opened, and since then ten others have been established; at the end of 1903 there were no fewer than 14,301 telephones at work in the Western, Victoria, Mayfair, Hampstead, Putney, Wimbledon, Richmond, Kingston-on-Thames, Chiswick and Croydon areas, but the total has since been increased to 22,181. In a few months exchanges will be opened at Epsom and Ealing, and others are contemplated at Crouch End, Finchley, Tarrow, Willesden Green, Wembley, The Hyde (Hendon), Barnet and Kenley. The switchboard at the Central exchange, Queen Victoria street, was first constructed to carry lines for about 6,000 subscribers, but has now been enlarged to its full capacity, viz., 15,000. It has been decided to erect in the same building a new exchange with a capacity of 18,500 lines.

PROGRESS OF MUNICIPAL TELEPHONES IN 1904.

The following table, prepared by A. R. Bennett, M. I. E. E., of London, shows concisely the progress made by the various English municipal telephone enterprises during 1904:

Place	Number of instruments working at Dec. 31, 1903.	Added during 1904.	Total at Dec. 31, 1904.	Junction lines working at Dec. 31, 1904.	Grand total of instruments and junction lines working at Dec. 31, 1904.
Guernsey	1,215	158	1,373	32	1,405
Glasgow	10,632	1,504	12,136	834	12,970
Portsmouth	1,486	553	2,039	20	2,059
Swansea	579	488	1,067	11	1,078
Brighton	431	1,199	1,630	28	1,652
Hull	.....	943	943	59	1,002
	.....	4,845	19,188	978	20,166

The total number of switch-rooms in operation was fifty. The best telephoned area in the United Kingdom still is Guernsey, which now has one telephone to every twenty-nine persons. In each place there is a considerable number of orders still to execute, amounting to 1,000 in the case of Hull.

TELEPHONE NOTES FROM ABROAD.

A project for a hotel for Paris telephone girls has been completed. Senator Jules Siegfried, former minister of commerce, is president of the organization having the matter in hand. Extensive grounds have already been purchased. The hotel will have 100 apartments, a co-operative restaurant and a library.

In spite of the prolonged agitation on the subject, only five municipalities in Great Britain have established telephone plants, and forty-one, after investigation, have decided not to do so.

The telephone line between Vancouver, B. C., and Victoria, Vancouver Island, has been opened for business. The length of the system is 100 miles of land line and fourteen miles of cable. The toll will be fifty cents for one minute's conversation and ten cents for every additional fifteen seconds. The British Columbia Telephone Company built the line.

It is expected that the telephone company now being organized in the United States by Dr. Bourns will be ready to begin operations in Manila not later than May 1, 1905. It intends to put in a conduit system.

The Question of Rapid Telegraphy

C. ADAMS-RANDALL.

THE able, exhaustive paper upon "Rapid Telegraphy" in a recent issue of TELEPHONY, by the well-known, persistent and consistent worker along lines of increased speed in telegraphing, P. B. Delaney, is so lucid and complete in facts, figures and fancies, that it needs no support. Having been, however, one of the early "Richmonds in the field," and fully appreciating the truths set forth by Mr. Delaney, I would like to add my *mite* and my *might* toward emphasizing the importance and value of a practical, efficient system of rapid telegraphy, embracing convenient, simple and improved means for collecting and for transmitting from the senders, direct, and from branch stations, social business and news messages at lowest cost to the senders and to the distributors. Such a system should include also means for transmitting and distributing with the least possible delay at minimum cost all messages so collected.

Such a telegraph system is not only of vast importance to telegraph companies, whose business is being largely affected by telephone competition, and would be ruined by it but for the continual increasing demands for intercommunication, and the high charges for long-distance telephone messages, but it is equally as important to the public at large, who require the service at lowest cost and with greatest promptitude.

The magnitude of the telegraph business that is now monopolized by corporations, but which with improved facilities and decreased cost may be easily trebled, or more, is, in fact, as important to our government as the postal service, and seemingly quite as much within its province.

This great question of improved telegraphy, which can be accomplished at greatly reduced first cost of plant and of service, with increased facilities, dispatch, and convenience to the public, together with the consideration of the great revenue therefrom, now diverted to the coffers of the present corporations, becomes important not only to present corporations, business men, and the public generally, but to "the man (or powers) higher up."

Mr. Delaney has very ably set forth the general principles involved in telegraphy as now practiced, and described the means, manual and machine, now generally used. The limit of speed by manual means with skilled expert operators, and by the present system of electro-mechanical or machine telegraphy, is also set forth in figures which cannot be honestly questioned, and certainly not refuted. One of the most important facts to which Mr. Delaney calls our attention is, that in spite of the great network of wires spreading in, through and from our cities and towns, the facilities for transmitting messages *on time* are far below the requirements. This explains partially the frequent delays, often of hours' extent. The following quotation from an editorial in one of the New York dailies is pertinent:

> Anything that makes communication between man and man quicker and easier is to be welcomed. Of course; but so far as actual time consumed in ticking through telegraphic messages is concerned, the limit for practical purposes has been reached. Meantime the long-distance telephone business grows fast, and if the tolls were cut in half there is but little question that the profits would be doubled—at the expense of the telegraph lines. The cold fact is, that for the purpose of quick communication, the telegraph—apart from press work on extraordinary occasions that are specially provided for—is "dead slow." Especially is this true of local service for private business. An example duplicated in thousands of places all over the country, is, that men frequently telegraph to their families fifteen miles out of New York, take a slow train two hours later and arrive home ahead of the telegram.

It is also a fact that, in the event of a breakdown from any cause, the telegraph companies refuse to guarantee the transmission of messages within a specified time. These delays are unnecessary, or at least can be reduced to the minimum, by the employment of new, more rapid and later methods of telegraphy, competition, and more stringent laws regulating the valuable rights of telegraph companies. Were the telegraph companies equipped with modern apparatus, as undeniably they should be, these delays need not occur even with the most serious breakdown, because with the rapid system one wire could be used to distribute messages, where now scores of wires are required.

As co-inventor with T. M. Foote of the Foote and Randall Rapid Telegraph System, which invention was put into practical use by the American Rapid Telegraph Company about 1880, I know personally that at that date, even, practical telegraphy was accomplished at the rate of 2,500 words per minute over long circuits. Certainly rapid telegraphy of to-day, with later methods and up-to-date devices, is capable of transmitting, at an even higher rate of speed, as against sixty words per minute by the manual Morse system "as its extreme achievement."

Does it not seem absurd that in these days when the old proverb, "Time is money," is most emphatically true, the telegraph service should be so slow, unreliable and costly, in view of the practical possibilities of new methods and apparatus, applicable to this purpose? Can anyone tell why this is? We hear about the objection to the use of "perforators," and "perforated paper," and "special receiving apparatus," and that the dots and dashes are not always clearly recorded, but I doubt if this can be the true reason for the non-use of the rapid system (by the powers that be), as these are trivial objections which can be readily disposed of in practice.

It is true that all rapid systems require specially prepared perforated paper—even the Wheatstone system does and yet it is used. As pointed out by Mr. Delaney, however, the perforating machines are comparatively simple and reliable, and do not require specially skilled operators. Mr. Delaney also describes a rapid system in which a positive making impulse is followed by a negative cutting off or spacing impulse which prevents "tailing" or running together of the recorded dots and dashes, the time elapsing between these impulses determining whether the character is a dot or a dash. The record, therefore, over certain fixed distances at a predetermined rate of speed *must be clearly and distinctly recorded, as all competent electrical experts must admit.*

These points being accepted, it would seem that the objections generally set forth against a rapid system are most trivial, easily overcome in practice and have but little weight against the main, vital, and important advantages, namely, lower telegraph rates, reliability, and the ability to use each costly main line circuit for the transmission of a vastly greater number of messages in the same time, than now is possible manually or with electro-mechanical apparatus. With a rapid system one wire takes the place of many, therefore reducing the first cost of plant, the interest and maintenance charges, the right-of-way expenses, and cost of labor per 1,000 messages, and consequently should lower the cost of telegrams to the public.

It is also certain that the application of the rapid telegraph to practical use would lead to other improvements in the system and apparatus, to still further enhance its value. This has been the history of the Morse system, steam en-

gines, electric motors and cars, and most all other inventions. I have knowledge now of a patent rapid system with which seemingly the speed of transmission and recording upon usual telegraph circuits is practically unlimited. With this improvement also a single circuit can be operated simultaneously, automatically and manually, *i. e.,* by the rapid and by manual Morse. This is another important and valuable advantage to a company using it.

By a characteristic record the dots and dashes are unmistakable and cannot "run together," because of "tailing," and the "dots" never "drop out." This means absolute reliability and ease and rapidity in translating. I would point out also that there is another most important feature in connection with telegraphy, which seems to have been almost entirely overlooked by telegraph companies and the "poor inventor." This is the intermediary stage of speed of transmission between Morse simple or duplex, and rapid telegraphy, that is, the possible *automatic mechanical transmission of Morse* or other symbols, by means of a keyboard apparatus that could be operated by anyone, similarily as typewriters are operated. Mr. Delaney touches upon this feature indirectly, when claiming that a good operator reading by sound and translating the dots and dashes by the use of typewriter can average forty words per minute, and suggesting that two sending operators using a modified perforator can transmit "over the line at a rate up to the highest ability of the typewritist receiver." This seems to be a step in the right direction to save time.

I have seen, however, a manually operated keyboard Morse transmitter, purely mechanical and not requiring perforated paper, that will transmit at a speed limited only to the expertness of the sending operator. One operator with this apparatus not only can send forty words per minute, but can transmit up to the highest speed possible to manipulate the keyboard, say from 100 to 125 or more words per minute. This apparatus seems to be the "missing link" between ordinary manual Morse transmission and rapid telegraphy.

This apparatus at branch stations or offices in cities and towns for sending messages to central or main distributing or transmitting offices means that messages can be collected at less expense for operators, and with greater speed and reliability, and, therefore, becomes at once an important adjunct to any telegraph system. It can also be used directly upon main line circuits to transmit preferred and ordinary messages and brokers' business, in lieu of perforated paper, at a speed dependent upon the sending operator, and limited only to the ability of the receiving operator to receive by sound, by shorthand, or by the use of an electro-mechanical recorder. This apparatus, therefore, in combination with the present telegraph system, and especially with a rapid system, for transmitting "rush" messages without the delay or necessity of preparing perforated paper, should prove an important addition to and an improvement upon all present means.

With substations in different sections of cities and towns connected through telephone exchanges in the usual way with subscribers, or with *special exchanges,* having telephone connections with subscribers grouped in classes, such as, for instance, brokers, shippers, merchants, manufacturers, etc., each in their class, the amount of business collected would naturally largely increase because of the dispatch and convenience and because such telephone subscribers or special exchange subscribers would become collectors.

With the Morse mechanical transmitter this increased business could be transmitted from the substations at more than double the speed now possible, thus supplying messages to the central office in greatly increased numbers and at decreased cost; certainly a decided advantage to the telegraph or distributing company.

As a further improvement, the operator in transmitting from the substation, by means of an electro-mechanical perforator at the central station, could automatically perforate the message ready for retransmission over the main circuit from the central office, instead of recording in Morse characters, thus saving one operator and time. Inasmuch as the present telegraph companies cannot handle with promptness and cheapness the existing business, this prospectively greatly increased business could not be undertaken by them without a great outlay for additional circuits. It would seem, therefore, that the telegraph company of the future, to successfully compete with the telephone in certain branches of intercommunication, to meet the continually increasing demands of business and of that which can readily be procured, and to transmit and distribute the same with dispatch, reliability, economy and low cost, must be equipped with a rapid system and its improved auxiliary devices.

The rapid telegraph not only is significant of dispatch, reliability and lower rates for service, but there is another most potent argument in its favor, namely, that at the present cost, at least of telegrams, and undoubtedly at less cost, the number of words per message can be increased many fold.

The American Rapid Telegraph Company, before referred to, was gobbled up, I presume, to get it out of the way, as its system has not since been put into use, but before its extermination it was proved that at a charge of one cent per word there was a good profit, and that certain messages at 25 cents per 100 words were most profitable.

As Mr. Delaney points out, "rapid telegraphy foreshadows great changes in correspondence. Outside of the present telegraph business there is a vast and profitable field for the development of an electrical correspondence for which the trains are too slow and the present telegraph and telephone too expensive and inadequate." That "between cities separated by any considerable distance all correspondence of any urgency will be telegraphed at a cost so moderate that the wire will supplant the trains as a mail carrier, and the relation between miles and time will be practically set aside."

These are strong suggestive statements, worthy of much consideration, from a practical, thoughtful telegraph expert. Such proposed business may be supplemented by the suggestion of having a special rate service for long business correspondence messages, to be dispatched as "night messages," thus gaining, at low cost, *hours* in many cases and *days* in others, over regular mail matter. The cost of such messages would be far below that of present telegraph and telephone service, and should not exceed 50 cents per 100 words, and probably could be furnished at half that rate.

On this general plan of rapid telegraphy, cheap ordinary day messages and electrical correspondence, together with special low cost long correspondence night messages, and the minimum cost of collecting, transmitting and distributing the same similarly as I have suggested, *future telegraphy* will so far eclipse the present system that it will be forgotten, like the old stage coach, and we will wonder how we managed to get along so long with it.

"Excelsior" is the resounding cry throughout this *little* world and especially in this *great* America. It occurs to me right here that there is now a grand opportunity for the Independent telephone companies to combine their interests and interconnect their toll lines already up and in use, for long-distance telegraph service between cities and towns, in combination with their telephone enterprises, and undertake this special rapid telegraph business, which at very little outlay, comparatively, for plant, would greatly increase their revenue from a source now lying dormant, and but little understood or appreciated.

With this combination hundreds of thousands of their subscribers would collect, or furnish free of cost, thousands of ordinary messages, and long correspondence messages on special terms for transmission at night, for early morning delivery at destination by telephone, messengers, or local mail. This would develop a business that, after regular tele-

phone business hours, when the circuits were quiet, would keep the same in use, and thus increase their value. At prices much below the present telegraph and telephone service, a revenue would accrue of vast proportions, the magnitude of which it is almost impossible to estimate. Further than this, the telephone metallic circuits are now used simultaneously for telephoning and telegraphing. There are no electrical reasons why the same practice may not be followed out in connection with rapid telegraphy and the telephone, thus again enormously increasing the value of the telephone plant.

I have thus hastily and generally reviewed the situation, and the possibilities of rapid telegraphy, *per se,* in combination with present Morse telegraphy and telephony, and have attempted to show that with the application of a rapid telegraph system and its improved auxiliary devices, the following advantages named are certain:

1. Less first cost of plant.
2. Dispatch, reliability and economy.
3. Increase of business at lower cost.
4. Reduced cost in, and greater facilities for, collecting messages.
5. Additional revenue at same or less outlay.
6. Increased value of existing plant.
7. Better service, and lower rates to the public.
8. Simultaneous rapid and manual Morse transmission over and upon the same circuit.
9. The combination with the telephone, for use on long-distance telephone circuits.
10. The probable simultaneous transmission over same circuit of telephonic and rapid telegraph messages.

The air is full of murmurs and rumors of combination, pointing to the possibility of a "Western Union, Postal Telegraph and Telephone Company," and of a gigantic "Western Union, Postal, Bell Telegraph and Telephone Company" in the near future. Where would the "common people" be then?

In the interest of cheap telegraphy, quick dispatch, convenience and reliability, and in view of the radical changes possible in telegraphy, through the medium of a rapid system, and the undoubted and unquestionable advantages to be gained by business men and the community generally, and considering the enormous revenue that must follow, do you not think that the time is ripe for a new company or corporation, or the Independent telephone companies, to undertake the introduction and practical application of rapid telegraphy?

A FAR-REACHING TELEPHONE SYSTEM.

In a recent report dealing with the so-called leading franchise trusts of the country, the eight leading ones were given as the American Bell Telephone Company, Western Union Telegraph Company, Commercial Cable Company, Federal Telephone Company, Consolidated Telephone Company, International Telephone Company, Inter-State Telephone Company and United Telegraph & Telephone Company.

The Consolidated Telephone Company, which occupies the fifth position among the franchise companies, made Buffalo its headquarters about two and one-half years ago, and in that short time, through what must have been extraordinary effort, it has developed one of the most comprehensive telephone systems in the United States. Aladdin with his wonderful lamp accomplished great things during his time, but his feats were hardly more startling than the accomplishments of this company, which, as a holding company, has financed and constructed in this short period a most elaborate and complete telephone system, composed of well-built and well-patronized exchanges and long-distance toll lines.

At its spacious suite of offices in Ellicott Square, the company dictates the affairs and keeps the books and accounts of nearly fifty different telephone organizations, located largely in western New York, and the control of which lies in the Consolidated Telephone Company through its ownership of the controlling interest in the stock of these various institutions. The mere work of getting started on a vast enterprise of this nature, that is, the work of getting the right of way from 50,000 or more property owners throughout so large a territory, would almost discourage the most energetic organization, but the construction of these numerous systems and toll lines in many parts of the state at the same time stamps this organization as one of unusual resources, administrative ability and progressiveness.

To protect itself for all time to come as to its telephone and switchboard equipment, this company bought some time ago, all the stock of the Century Telephone Construction Company of Buffalo, New York, not only for the uses of the Consolidated Telephone Company, but for sale of apparatus and supplies to the 10,000 or more Independent telephone companies in this and foreign countries. This company has recently made some large shipments of telephone switchboards to the continent and is daily making shipments throughout all parts of the United States.

The Consolidated Telephone Company also constructed its 1,200 miles of lines and controls the Inter-Ocean Telephone & Telegraph Company, which handles the long-distance business for the Independent telephone exchanges in western New York. It does the long-distance business for the Frontier Telephone Company of Buffalo, as well as other Independent telephone exchanges, and patrons of these Independent companies when talking toll or long-distance, pay tribute to the Inter-Ocean Telephone & Telegraph Company.

There are now in the neighborhood of 75,000 telephones connected to the lines of the Inter-Ocean Telephone & Telegraph Company, which is remarkable, particularly in view of the fact that this company has been but about three years in its work of construction and about one and one-half years in actual operation in some parts of its system, and when it is taken into consideration that only about five per cent of the public is using telephone service to-day, it can be well understood that even this extraordinary development is but the beginning of a tremendous telephonic movement in the immediate future.

The advent of competition in the telephone business has brought forth some wonderful results in the expansion of this line of trade, as for instance at Geneva where there were about 150 telephones prior to the advent of the Consolidated Telephone Company, its local company has over 1,000 subscribers at this time, as against about fifty subscribers of its competitor, and at Hornellsville, where prior to its advent, there were about 250 subscribers, there are now 1,300 subscribers on the lines of its local company, as against about 200 of its competitor. These cases are but two of the important instances in an unbroken list of successful development of subsidiary companies within the last three years.

One of the most remarkable things about the Buffalo organization is the fact that each and every operating company controlled by the Consolidated company is showing attractive financial profits in excess of all charges and is absolutely free from all liabilities excepting its regular bonded debt.

The president of the Consolidated Telephone Company and, in fact, of all its subsidiary companies is B. G. Hubbell, formerly of Cleveland, but for the last three years a resident of Buffalo. His is the master mind to which is due the Independent telephone development described here only in outline. His abilities lie not only in a practical knowledge of telephony, but are fully as great in finance and administrations.

Independent Possibilities in the Far West

I. J. KUSEL.

LEAVING Chicago over any of the leading western trunk lines, we traverse the broad prairies of Illinois and Iowa, where we find thousands of miles of Independent toll lines, and at all of the important points, as well as at nearly all of the unimportant towns and villages, Independent telephone exchanges. Going back some ten years, we find an open field, uncovered, as it were, by any Independent exchanges or toll line companies, while to-day the condition is just the reverse. Where a few years ago the question was to find investors for the places offering openings and opportunities for the installation of Independent plants, now this difficulty is past, and the field has been well covered, excepting in spots here and there, and in consequence the operators and builders who are seeking points for investment must travel farther west.

In the state of Nebraska there are still a great many fair openings that offer good returns upon the investment. Crossing into Colorado one finds the situation peculiar. While the state has a few Independent exchanges, there are yet grand opportunities for energetic investors. The conditions in Colorado are slightly different from those in the eastern states, for the reason that to secure the business properly it is essential that toll connections be established about as quickly as the construction of the main points for the local exchanges, and as the monopoly company is, considering the cost of building through the mountains, giving lower rates than they are in any other section, it makes the question of constructing Independent toll lines and plants in Colorado different from that which is found in other sections. Notwithstanding this, however, Colorado offers some grand opportunities. Only recently the charter of the city of Denver has been changed for the purpose of allowing competition in just such instances as an Independent telephone exchange offers. Several times in the last few years efforts have been quietly made, but in each instance the parties have been bought off.

Toll rates in Colorado are comparatively lower than in any other part of the United States in which the Bell company is operating. Local rates are high. It has been the policy of the Colorado Bell Company in the past, whenever and wherever it can, to purchase outright competitive plants, at fancy prices, to ward off any growing competition.

Traveling through Utah, we find at Salt Lake City a strong and healthy competitor, gaining in the field each day, and one that will develop this state. Utah offers good openings at moderate sized points, owing to the strength of the Independent company at Salt Lake City.

Traveling on west across Nevada we find a few small openings, but conditions for toll connections a little hard, owing to the long distances between points of consequence. A similar condition is encountered going up through Idaho, via the Oregon short line. The golden opportunities, however, lie throughout the states of Washington, Oregon and California, and British Columbia. These states, and this territory just named, offer splendid openings, for the following reasons: Many of the best points are open for Independent competition, or are desirous for the same, and as the Bell rates are high, Independent companies will be welcome.

Splendid red cedar poles are to be obtained almost for the cost of the cutting along the Williamette river, as well as the Columbia, and while items of freight are to be taken into consideration, in a general way, in securing supplies from the east, the cost of poles, Washington fir cross-arms, pins, brackets and wire, which is secured from the San Francisco market, are all obtained at as low, and in some instances lower, prices as similar items in the eastern market, and on poles and cross-arms, a great deal of money is saved, owing to the favorable building conditions existing in this section in relation to these latter named items. As an illustration, it is possible to secure an ideal red cedar pole fifty feet in length at a cost of $2.50.

The writer inspected several plants built in the section named, where he viewed leads of poles—forty, fifty and sixty footers—none of which stood in the ground, and which cost the builders not to exceed a five-dollar bill each. So summing up the situation the cost of building a high-grade, up-to-date telephone exchange on the coast is as low or lower than it would be in the states of Iowa, Illinois or Missouri, quality of material, poles, etc., considered.

One very noticeable condition in line construction on the coast over all other sections of this country, and the first thing that will impress a telephone man, is that a regular ten-pin cross-arm, which in the eastern section of the country is made to carry twenty wires, here in the west carries usually thirty wires, and in several exceptional instances as high as forty wires. This, at first glance, to one who had never observed such construction, seems almost impossible. The reason for such a condition is that in the coast states they do not know what a sleet storm is and do not experience as a general thing excessively high winds, all of which favors such method of construction. However, in the east this same construction would be considered poor engineering.

The writer observed that the Bell company's method of construction consisted almost wholly of knob construction. It is only within the last two or three years, since the Independents have gone to a few places on the coast, that a regular pin and insulator method of construction on cross-arms, such as is used in the east, is employed; but even in this instance the leading Independent companies on the coast are double pinning their cross-arms—that is, a pin below as well as above the arm, giving the arm a capacity of twenty wires, where regularly it would have only a capacity of ten.

The Bell's rates are high on the coast. This point needs no argument as to the opportunities offered. The monopoly's method of operation, nearly altogether on the coast, is two or four-party lines.

While, as previously mentioned, there are quite a few of the leading points built up already, splendid openings yet remain for Independent plants in the far west. To anyone who may wish to further investigate, as applied to given points, the writer is in possession of this information, and will be glad to furnish the same to any party or parties contemplating a western trip.

To illustrate as to how the people in a general way take to Independent telephones, the city of Los Angeles may be cited as an instance, it having more telephones in proportion to its population than any city in America, and while it is true that the entire population of the coast does not exceed the population of the two largest cities in America together, the people are energetic, hustlers and up-to-date, and absolutely demand the most approved devices and methods known in the operation of telephone exchanges. They patronize them liberally, and what they lack in numbers they make up in their spirit of enterprise.

Particularly may be cited splendid opportunities in the vicinity of Marysville, California. Sacramento may be pointed to by Independents as a city possessing that indom-

itable independent spirit which always insures success, and to the credit of Mr. Dillman, general manager of the Capitol Telephone & Telegraph Company of Sacramento, may it be said that intimidation, threats and fierce patent litigation (against the company were directed the efforts of the monopoly on the Firman multiple patents) neither frightened nor discouraged either him or his company. From the first they put up a plucky, winning fight.

Another noticeable thing that strikes the Independent operator is the obsolete type of apparatus employed by the Bell. Plenty of Blake transmitters are to be seen, and at the larger points, magneto systems. At San Bernardino a fine Independent exchange is in operation.

Traveling through Arizona the main points are well covered, the Prescott Electrical Company operating two splendid exchanges (and may it be said to the credit of the Independent field) to the exclusion of the monopoly at Prescott and Phoenix. Traveling still farther east through New Mexico the Independents cover the field thoroughly. At Albuquerque, Los Vegas and Santa Fe are to be found excellent Independent exchanges. Leaving New Mexico, traveling toward Old Mexico, are to be found a few "prospects" of minor consequence, with a good opening at El Paso, Texas.

In the words of Horace Greeley, when the investor and builder cannot be suited, or find points that will interest him in the eastern and middle west portions of Uncle Sam's domain, "Go west," and build telephone exchanges in a country that has already started to "grow up."

SPEECHMAKING BY TELEPHONE.

A successful evening with telephones was recently spent by the enterprising members of the Commonwealth Club of Upper Montclair, New Jersey, and their friends in the clubhouse at that place. Unique among the features of the unusual entertainment, which was the first of its kind in that part of the country, was a short and witty talk on "Frenzied Finance," by Thomas W. Lawson of Boston. Mr. Lawson, from his home in the New England metropolis, talked for several minutes to forty men at telephones in the clubhouse on the topic that is making such a stir throughout the country.

Mr. Lawson was induced to talk by Erman J. Ridgeway, of the Ridgeway-Thayer Company, publishers of Everybody's Magazine, which is running the series of "Frenzied Finance" articles. Mr. Ridgeway called up Boston on a special wire and secured Mr. Lawson direct at his home.

"Hello! Hello! Is that you Lawson?" those in the room heard Mr. Ridgeway say, for they had receivers to their ears.

"Yes, yes," the answer came back from Mr. Lawson distinctly through forty receivers.

"Hello, old man, how are you?" Mr. Ridgeway asked.

"All right. Are you alone?" responded Mr. Lawson.

"Yes."

"Connect your men and I'll talk to them."

"All right, they're on now."

"Good evening, gentlemen," came the voice of the financier, "I understand that the robins in Upper Montclair are going to build their nests next spring to the tune of 'Frenzied Finance.'"

This caused a laugh, and then Mr. Lawson resumed: "We hear so many queries as to just what 'frenzied finance' is that it may interest you if I tell you a story that illustrates the relationship of the people and the 'system.' Two Irishmen were riding on a trolley car in Boston the other day when the question of frenzied financiering was raised. 'Phwat's that?' asked Pat of Mike. 'Well, if yez would get off the car I could show ye all right.' After some argument it was decided to alight.

"In the street Mike persuaded Pat to get down on his hands and knees, whereupon he set his bull pup upon him. The lusty canine removed the lobe of Pat's ear, and that worthy yelled with pain. He besought his friend to call off the brute and demanded explanation.

"'Youse see,' said Mike, 'how it is. You ripresented the people and the pup ripresented the system.' 'But he bit a piece out of me ear,' wailed Pat. 'Sure,' iterated Mike, 'that's the makin' of the pup.'"

The arrangement of the clubhouse for the novel entertainment was complete and interesting. There were three tables in the main room of the clubhouse. On the first were twenty telephones with direct wires to the Newark and Proctor's theaters, in Newark, New Jersey. On the second table were forty telephones with direct connection with the Orpheum Theater, Brooklyn. Arrangements had been made at the playhouses mentioned to enable the suburbanites to distinctly hear all of the dialogue and music of the several performances. A large funnel was inverted over the stage in each case to gether the sounds from below. From the horn of the funnel it was conveyed over the wires through exposed transmitter plates to the listeners at the Commonwealth Club. On the third table were forty more telephones, making 100 in all. They were connected with various points, as desired, according to programme. It was by means of them that Mr. Lawson conveyed his thoughts to the clubmen.

The first number in the varied part of the programme was a vocal selection sung by the Aeolian Male Quartet at Long Branch, sixty-five miles away. There were several encores, the music being concluded with a clear rendition of "Good Night." Charles H. Fuller, from the snug library of his Boston mansion, told his hearers 250 miles away about the origin of the telephone. The advantage of the telephone over the telegraph, he said, were seen in that even a Chinaman might converse with a friend in his native tongue.

From Paterson, nine miles away, came the sweet strains of instrumental selections by the "Crescent Musical Four," and a piano solo. The reproduction of a cornet solo by a phonograph in Delawanna carried over the fifteen miles separating it from the listeners with remarkable clearness. W. A. Blanchard told funny stories about telephonic communications from his Philadelphia home. The last number on the varied programme heard over the telephones on the third table was three tenor solos rendered by Edgar W. Dennison, in East Orange.

Still another case of speechmaking by telephone was that of Representative Greene of Massachusetts, who sat in a telephone booth in Washington recently and delivered a speech to the guests of the Boston Paper Trade Association assembled around a banquet board in the Hub City. Every word spoken by the Congressman was distinctly heard at the table, and after Mr. Greene concluded his remarks he was rewarded by a hearty cheer that sounded plainly over the 450 miles of wire.

UNDERGROUND CONSTRUCTION.

The Home Telephone Company of Santa Monica, Cal., has been granted permission to place its wires underground.

The Bangor (Maine) Automatic Telephone Company has applied for permission to build underground conduits.

The Peninsular Telephone Company of Detroit, Michigan, is planning to spend $25,000 in underground construction work.

The telephone companies in New Castle, Pennsylvania, have consented to put all wires in the business district underground.

The Monmouth (Ill.) Telephone Company is engaged in laying wires underground in the business district.

Telephony.

AN ILLUSTRATED MONTHLY TELEPHONE JOURNAL

TRUTHFUL ❧ FEARLESS ❧ INDEPENDENT

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Table of Contents.

Telephone Construction Practice—H. J. Minhinnick..... 193-198
Conventions of Independents..... 199-202
Bankers Buying Up Independent Securities—William Clendinin 203-205
An Important Decision..... 206-207
The Situation in Connecticut—D. A. Reynolds..... 208-209
Digest of Telephone Literature—Samuel G. McMeen..... 210-213
In the Financial Field..... 214-216
Simultaneous Telephony and Telegraphy—C. A. Stone.... 217-219
Fine Showing Made by Louisville Home Telephone Company 219
Questions and Answers—J. C. Kelsey..... 220-221
Concerning Telephone Switchboards—Samuel G. McMeen. 222-223
The Telephone in Foreign Countries..... 224-226
The Question of Rapid Telegraphy—C. Adams Randall. 227-229
Independent Possibilities in the Far West—I. J. Kusel.... 230-231
EDITORIAL—
Publicity, Truth and Independent Telephone Securities 232-233
Lest We Forget 233
The Traffic Engineer..... 233-234
The Cincinnati Telephone Decision..... 234
Bell Methods Get a Setback in Michigan..... 234-235
Service Tests 235
Editorial Etchings 236
The Automatic Problem—Arthur Kneisel..... 237-238
Digest of Telephone Patents—Edward E. Clement..... 239-245
Decisions Affecting Telephony—G. W. Hand..... 246-247
Telephone Line Engineering—C. J. H. Woodbury..... 248-254
Eliminating Isolation From Farm Life—Fred DeLand.... 255-258
Where "Central" Goes to School..... 259-260
Telephone Tales Tersely Told..... 261-262
Personal 263
MANUFACTURERS' DEPARTMENT—
A Simplified Protector..... 264-265
Western Electrical Company..... 265
"Little Giant" Pole Raiser..... 266
Bouquet for Chicago Telephone Supply Company.... 267-268
Novelty Potheads and Sleeves..... 269
The Lundquist Automatic Trunking System..... 270-274
Trade Notes 275-276
In the Rural Line Districts..... 277
Incorporations of the Month 278-279
Annual Meetings 279-282

PUBLICITY, TRUTH AND INDEPENDENT TELEPHONE SECURITIES.

EVER since entering the field of Independent telephone journalism it has been the constant aim and earnest endeavor of TELEPHONY to impress upon the minds of financiers and investors the value of Independent securities from an investment standpoint. As the acknowledged leading champion of Independent telephone interests it has from month to month, for several years past, presented facts and figures to bear out its claims in behalf of Independent bonds as dividend-paying propositions. In the early days of the movement there was naturally something of uncertainty as to whether or not the Independents would find the field as financially profitable as they had reason to hope it would be. There was a brief season of suspense—an anxious period of waiting for the "returns" to come in—and then came reports from all sides of Independent successes—successes accomplished, in many instances, in the face of adverse circumstances and the bitterest opposition ever encountered by any business movement in the history of the country.

All this is so well known to our readers that a bare mention of the fact will suffice. And the growing prominence of Independent securities in the financial market is also thoroughly well known to all those in any way interested in the great movement. Men of means no longer stand afar off and look askance at bonds bearing the Independent stamp; on the other hand, they are all interest as to these securities and avidious in no small degree to invest their money in this direction and to back Independent telephone enterprises with their capital.

No better proof that Independent enterprises are paying, and *paying big*, can be adduced than is found each month in the financial department being conducted by this paper, and if still further—and perhaps even more convincing—proof is needed in this direction it may be found in the series of financial articles now running in this paper, and of which Mr. William Clendenin is the author.

It is a matter of great satisfaction to TELEPHONY to see Independent securities being recognized at their true value, and being sought after by bankers, investors and captains of industry of vast wealth and influence in the financial world. It not only shows that these men know a good thing when they see it, but it demonstrates that the position this paper has all along taken on the question of Independent securities is right, and that its campaign of education along this line is bearing fruit.

Within the past few months other papers have joined TELEPHONY in its work of enlightening investors in the matter of Independent bonds. Not the least among these is *Finance*, published at Cleveland. In a recent issue it had the following to say upon this all important subject:

"There is no other security that we know of that can be shown to such good advantage as the average Independent telephone security. Its earnings are large and its affairs are in such shape that they can be readily presented. The question then is one of education, and it is up to the Independent telephone people as to whether they are going to get busy and help present these facts to the investing public, or whether they are going to allow all the energy, all the push and all the educational work to be done by the Bell interests."

The matter of "education" is a point well taken by *Finance*, and is the very thing that TELEPHONY has been doing for years. We heartily agree with the sentiments enunciated above, and particularly the suggestion that the Independent companies "get busy" in connection with presenting to the investing public in intelligent form the simple facts regarding the real value of Independent telephone securities, and what may be expected in the way of financial

returns for capital invested in this direction. The results will be surprising.

And right along this same line we desire to call the attention of our readers to the efforts of one man in spreading Independent gospel, and incidentally in forcibly bringing to the attention of thousands of people the power and extent of the Independent movement and the value of Independent investments. At Concord, New Hampshire, Robert D. W. McKay, a man endowed with pluck, energy and the true Independent spirit, has made application for a telephone franchise, his purpose being to install a complete automatic plant in that city. The Bell company has had a monopoly there for years, Concord having long been known as a "Bell town." The people of the place had come to know in a vague way of the work of the Independents elsewhere, but had not the least knowledge of how Independent doctrine applied locally would affect the telephone situation.

Facing these conditions Mr. McKay started in to educate the citizens of cultured Concord along the lines of Independent telephony. He contracted for a half column of space in each of the daily papers, and every day for weeks past he has filled this space with straight-from-the-shoulder Independent telephone doctrine, both as applying to the local field and in a general way. The result has been that where three months ago Concordians knew little or nothing of the great Independent telephone movement, to-day they have a comprehensive knowledge of the general situation, are clamoring for an Independent company to oppose the Bell in their city, and are giving Mr. McKay not alone their moral but generous financial support. The Bell is resorting to its usual underhanded tactics in fighting Mr. McKay and his public-spirited undertaking, but in spite of this there is every reason to believe that he will succeed in his purpose and rescue the telephone-using public of Concord from the grasp of an oppressive would-be monopoly. Mr. McKay richly deserves success and TELEPHONY voices the sentiment of every Independent worker in the United States in the wish that he may abundantly succeed.

Returning again to the question of Independent securities we quote the statement of Ed. L. Barber, the well-known Independent telephone man of the firm of Barber & Bailey (Central Construction Company), Toledo, who says:

"Relative to Independent telephone securities, I do not know of the time that they have handled as well as they do right now, and I can say that the outlook for them going high is better than it ever has been to my knowledge. There are a number of good propositions in sight, and I think they will all be handled, and people are taking hold of the financial end of Independent telephone enterprises now that a few years ago would not look at the securities. Of course we are all very glad to see this, and it will help all of us."

LEST WE FORGET.

IN January, 1902, the Bell company secured control of the Kellogg Switchboard and Supply Company, and since that date has tried to hoodwink Independent telephone men into buying Bell apparatus under the Kellogg nameplate. For a year and a half the change in ownership was successfully concealed from telephone men, the Bell company using its usual tricky and underhanded methods to keep the sale a secret. So long as the Bell ownership of the Kellogg company was unknown Independent operating companies could not be particularly blamed for purchasing Kellogg apparatus, *but for the past twenty months no Independent telephone man should have purchased one dollar's worth of Bell-Kellogg equipment.*

Surely we know the Bell method well enough to not play its game. If we give it the sinews of war in the shape of profits on Kellogg apparatus, we may rest assured these profits will be used against us in every way possible. The Kellogg company naively says it will give a bond to Independent buyers. Whose bond will it give? And what kind of a bond? Why doesn't it come out squarely and say it is Bell, and that the bond is a Bell bond? Things are coming to a pretty pass if Independents are to buy *Bell apparatus under a Bell bond, and the profits therefrom be used to try to crush out Independent telephony.*

Don't be fooled by the talk of a bond. When a company has to give a bond under such conditions—a bond to guarantee its business honor—the bond of that company is not worth taking, and it has no business honor left to guarantee. The bond is no better than its maker, and we have known the Bell company and its despicable methods, lo! these many years.

We feel more than ever that the Kellogg Switchboard and Supply Company is a menace to the Independent movement, and we shall do all in our power to show the concern up in its true light—Bell to the core. And you, Mr. Independent Operator, you have been given permission to operate your exchange as an *Independent exchange.* Your franchise probably contains a provision that you *shall not sell out to the Bell.* You have no right, with this contract, made between you and the people, to permit the shadow of the Bell to fall upon you. *You must be above the possibility of reproach.* You have no right to endanger the public's right to the service of an Independent exchange. *You do endanger that right when you use apparatus made by the Bell company or its affiliated interests*—the Kellogg company, for example. You make it possible to cripple your service and are *not* Independent.

There is no middle ground. You must be one or the other—Independent or Bell.

THE TRAFFIC ENGINEER.

IT is only recently that in the Independent telephone field proper consideration has been given to the problems of telephone traffic. We see thousands of articles on circuits, and the layout and construction of pole lines, etc., but few seem to realize that after all the root of the entire telephone problem is traffic. In the past many exchanges have been designed in a haphazard way, the mental performance on the part of the designer being about like this: "Let's see, we will have about so many subscribers, and we will provide about so many lines, each operator can handle about so many subscribers, and we had better provide a switchboard of about so many positions; no, I guess we had better make a few more lines, and only figure on each operator handling so many, which will make a switchboard about so much larger."

When it comes to trunks between the various offices or between the toll board and the local board, the problem has been decided in an even more vague way. The result!!! Either the entire plant was much too large, thus involving too great an investment; or much too small, thus involving expensive additions, which if made at the proper time could have been done at far less expense.

Happily these conditions are changing; there are men who do not have to guess as to how many lines will be required to fulfill certain requirements, or if there is a guess, it will not be a haphazard one. There are men who know beforehand with a small percentage of error how many calls will be made in a given community for a given number of stations, and how many of the lines serving this community an operator may handle. There are men who can tell how many trunk lines should be provided between two offices of given characteristics, and, lastly, there are men who have shown their ability to go into what is considered a well-equipped and well-operated central office and reduce the

operating force by a large percentage without burdening the remaining operators with an undue amount of work.

Such a man is the traffic engineer, and as his place becomes more distinctly recognized in the telephone field, existing evils of many plants that are now supposed to be well designed and operated will be eliminated.

THE CINCINNATI TELEPHONE DECISION.

THE Circuit court of Cincinnati recently delivered an opinion in the suit of the Queen City Telephone Company against the city, involving the right of the company to construct and maintain telephones wires in conduits in the streets of Cincinnati. It will be remembered that application was made to the city by the company for the right to construct its lines underground; that that application was refused and a petition was then filed in the Probate court asking for a grant because the city had refused. After a hearing that occupied several weeks the late Judge Nippert issued a decree defining the mode and manner of the use of the streets by the company for its lines, some to be overhead and others to be underground. From this decree appeal was taken by the city to the Common Pleas court. Judge Littleford there held that the decree of the Probate court should not have been issued. Then the company took the case to the Circuit court and that tribunal sustains Judge Littleford in his reversal of the Probate court.

This last tribunal lays especial stress upon the right of the company to lay conduits in the streets of the city without the consent of the authorities of the municipality. In the opinion it is asserted that, while all the streets of a municipality might be subjected to the use of the company by the Probate court in a proper case before it, that tribunal must do so by a consideration of each street or alley, and cannot, in any case, make a general regulation as to all the streets and alleys. To make such a general grant would be a legislative and not a judicial act, which the Probate court has no power to do. It is held also that the decree of the Probate court was not in reality a decree, but was in effect an ordinance, an act of legislation, and it is declared the Probate court misapprehended its power.

The court then says that in any event the company had no right to construct and maintain underground wires and conduits. This, because, as the court interprets the law, the statute requires that the company that desires to construct and maintain underground wires and conduits must be one which owns and operates a telephone exchange or is doing a telegraph business in any city in Ohio, and has obtained the consent of the municipality in which it is desirous of constructing such lines. It is declared by the court that there is no authority given by the law to any other sort of company to so construct such lines.

As it was admitted that the Queen City company was not and is not operating a telephone exchange in Cincinnati, nor was it doing a telegraph business, it has no right to construct and maintain underground wires and conduits in this city. And, besides, it is held that if it had been doing such business it would be necessary to get the consent of the city authorities to lay the wires. As such consent was refused by the city, the company was concluded. And as it was thus concluded, it had no right to go to the Probate court for such grant, and, going there, that court had no right to make such a grant.

As to the other question in the case—that is, whether the Queen City Company was properly organized as a corporation under the laws of Ohio, which proper organization is necessary before it can make an application for franchises—the court holds that the company has not fully complied with the law as to its formation and election of directors. Thus, if the court had not found against the company on the other ground, it would have denied it the rights sought because of the last-named ground.

Judge Jelke concurs with Judges Swing and Giffen as to the decree of the Probate court being purely a legislative and not a judicial act, but he dissents from the other judges in holding that the combined application of sections 3454 and 3471-I of the statutes limits the construction of lines to those of overhead character, and that only companies having and operating an exchange in the city can construct underground systems, because such a construing of the law would tend to the creating of a monopoly. He concurred that the company had not been properly organized.

The net result of this decision is that at present the telephone company that is now operating in Cincinnati has alone the right to do a telephone business there, and the Independent companies are shut out; that until such Independent companies find, first, a means of establishing and operating an exchange in that city, and, second, then obtain the consent of the city authorities, they cannot invade the field with their lines, and the present operating company is left with a monopoly of the business.

Independent telephone men of Ohio, however, are quite confident that the Supreme court of the state will reverse the decision of the Circuit court of Hamilton county. This case will be carried to the Supreme court, and Independent telephone men say that a decision may be expected within two months. James B. Hoge, president of the Independent Telephone Association of America, said:

"If this Cincinnati decision is good law the Bell company, in Cincinnati, has no right in that town, as it is operating under a Probate court franchise the same as was granted to the Queen City Company. The Bell opposition may keep us out of Cincinnati a little while longer than we expected, but *we are eventually going to have a first-class plant in that town.*"

BELL METHODS GET A SETBACK IN MICHIGAN

THE city of Mt. Clemens, Michigan, is in the throes of a telephone agitation—a general revolt at Bell methods—that is sure to ultimately result in the organization of a home Independent company, and the securing of what it has never had in a telephone way—good service, reasonable rates and courteous treatment. For several years past there has been much complaint at Mt. Clemens on the poor service rendered by the Bell people and the arbitrary methods it has adopted in dealing with subscribers—the same old story that has been heard in thousands of towns and cities throughout the country. Matters were brought to a sudden head recently in that city when the Bell company announced a raise in rates—in some instances of 100 per cent—which caused the telephone users to wax indignant and gave birth at once to a strong Independent telephone sentiment there. The Business Men's Association took immediate action in the matter and called a meeting of citizens to protest against the Bell's proposed raise in rates. Hundreds of people attended the meeting and placed themselves on record as against any raise in telephone rates and in opposition to Bell methods in general. The sentiment of the meeting was emphatically in favor of the organization of an Independent company, hundreds of those present agreeing to take stock in such a corporation. A committee of leading citizens was appointed to see President W. A. Jackson of the Michigan Bell company, and if a promise is not secured that the rates will remain as heretofore, a new company, to be known as the Macomb County Telephone Company, will be organized, to operate in Mt. Clemens and vicinity.

Immediately it found opposition in the city the Bell

company entered upon a campaign of falsification as regards the Independent telephone movement, and Independent telephone companies now in operation, its purpose being, through misrepresentation, to put the Independent cause in such a light before the people of Mt. Clemens as to discourage them and cause them to drop their plans for a home company. The Bell's representatives caused to be circulated the report that in the event of an Independent company being started at Mt. Clemens it would slash the rates in that city to the last notch and drive all opposition to the wall. Whereupon the citizens loyally replied that in case an Independent company should enter the local field they would support it unanimously and would not again use the Bell service at any price. The Mt. Clemens *Press* took up the fight of the Independents, and in an editorial said:

> The attempt of the Bell telephone people to pull the wool over the eyes of the telephone users in Mount Clemens, by trying to tell them that no Independent companies are paying, should be resented by people who believe in fair play and a square deal. The Bell people *know* that many Independents are paying. Furthermore, they are *afraid of the Independents.*
>
> The large aggregate amount of new capital required for the proper development of the telephone can be financed among some 5,000 Independent companies in the United States, at an average of $110,000 each, when it is considered that these companies are owned largely by the telephone-using public. It is estimated that the present Independent companies have 300,000 stockholders, and the number is increasing every day. The Independent telephone movement is co-operative in the best sense. Each community can finance its own telephone needs and should have the profits.
>
> Every Independent company gladly connects with neighboring companies for the interchange of long-distance service, thus completing a national system of communication built up by the combined work of the vast army of local stockholders and subscribers throughout the country.
>
> Is it reasonable to look forward to a telephone monopoly in the United States under these conditions? The fact is, the telephone business is yet *in its infancy,* but growing with lightning rapidity, and the public won't wait fifty years, nor even ten.
>
> But this is not the only reason why the Bell company cannot and will not be allowed to have a monopoly of the telephone business. The best service—that is, the most efficient and economical service—cannot be furnished by the Bell companies. While the patents of the parent Bell company were expiring, the Independent companies were originating new methods in the art, and to-day control the most important patents, including the "girlless" telephone system—an automatic system in the truest sense of the word.

This same paper immediately set about gathering Independent evidence to be used against the Bell in Mt. Clemens and to refute its claims. From day to day it has presented information and data that have exploded every claim put forward by the Bell in its underhanded fight on Independent sentiment in that city, and it is doubtful now, if the Bell should continue its former rates, or even reduce them, that it could head off the entrance of an Independent company into the Mt. Clemens field, so strongly are the citizens in favor of it.

TELEPHONY would urge the people of Mt. Clemens to keep up the fight against the Bell now that the issues are clearly defined and not to put any stock in the promises the Bell people are sure to make them now that they see breakers ahead, for just as soon as it has the opposition calmed down it will break faith with them with as little compunction as a Chicago bandit holds up his quarry—just as it has done in a thousand and one similar instances. The Mt. Clemensites evidently have the upper hand in the local telephone situation. They should by all means keep it.

SERVICE TESTS.

IT has been said recently that among many telephone companies little has been known even by the managers of the companies as to the real quality of the service they are giving. This is probably true and the reason may be two-fold: first, the companies do not know what good telephone service is; second, they depend on the subscribers' rather than on their own observations as to its quality. Sometimes great claims are made that a certain company is giving "two-second service," *i. e.,* service in which two seconds on the average elapses from the time a subscriber calls until an operator answers.

This may be a highly desirable condition, but does it tell the whole story? Certainly it does not; there are many more factors concerned in the giving of good service than the mere promptness of the response by the operator. The question also naturally arises: Is it good policy to give this much vaunted "two-second service"? Suppose that by giving four-second service an operator, without being unduly crowded, will handle a considerably larger number of lines and handle them well: In other words, would it not be well to make a little investigation and see how much this two-second service is costing the operating company, and whether its advantages are worth the price?

TELEPHONY ventures to suggest that some operating companies in following up this prompt-response idea to such bitter ends may be seriously impairing the quality of other portions of the service. Telephone service does not consist merely in prompt response, but all the factors of the service should be so balanced as to bring about this end: that a call shall be completed and the called for subscriber's response obtained in the shortest possible average time, and without annoyance or discourtesy to the public.

ENGLAND WILL OWN BIG TELEPHONE SYSTEM IN 1911.

THE British postmaster-general has come to an agreement with the National Telephone Company to take over its business and buy its plant on December 31, 1911. Lord Stanley is congratulated by the London press upon the submission to parliament of what is considered to be a very good and fair bargain, by which both taxpayers and the telephone user should do very well.

The price to be paid for the business is to be settled by arbitration. All that is to be paid is the fair market value of the plant and works of the company. The purchase is to be on what is called "tramway terms"—that is to say, no payment is to be made in respect of compulsory purchase, good will or past or future profits. Exceptions are made in regard to the private wire business of the company, which can be carried on without the postmaster-general's license, and in a very few cases where the company's license has been extended beyond 1911.

Three-fourths of the whole purchase money may at the option of the government be paid by way of annuity for a term not exceeding twenty years. The postmaster-general also retains certain powers, enabling him to object to the purchase of any plant unsuitable for the carrying on of the business.

In order to insure the efficiency of the service during the company's continuance in possession, it is bound by agreement to allow intercommunication without additional charge between the systems of the postmaster-general and the company, and is precluded from showing favor or preference as between subscribers. While the minimum and maximum rates it is to charge are fixed, if, on complaint, and after full inquiry, it is proved that the company is giving inefficient service in any district, the postmaster-general may take over the company's business in that district at once without any payment for good will.

It is impossible to estimate with a great degree of accuracy the price which the government will have to pay for the telephones. When in April the postoffice took over the trunk lines the cost was $2,295,570, but the purchase of the whole business is, of course, a much more serious matter, from the fact that the company has a share capital of nearly $22,500,000, with debentures amounting to nearly $20,000,000.

DR. ELISHA GRAY AND THE ELECTRIC BATH TUB.

A GOOD many years ago, Dr. Elisha Gray, of blessed memory, experimenting with an electric bath tub, and a small induction coil furnishing an alternating current, found that when his wet hand rubbed on the wet metal of the tub while current passed between them, a musical tone was heard. The pitch of this musical tone agreed with the pitch of the vibrator of the induction coil. By deduction he concluded it agreed in frequency with the current passing from his hand to the tub.

As in the case of Archimedes, the inspiration of the tub caused Dr. Gray to see at once a useful application of the observed phenomenon, and he at once undertook the construction of an electrolytic receiver to be used in a harmonic telegraph. The idea so happily hit upon remained in this condition of development for a long time, when, visiting in Milwaukee, Dr. Gray saw a street vender offer for sale a "lover's telegraph" having two drum-head discs connected by a string. Asking himself why this might not be done by electrical and magnetic means, Dr. Gray undertook to utilize his bath-tub experiment, in this instance in connection with a telephone transmitter.

Now, after the lapse of many years, comes a scientist, and records the observation that an electrolytic cell containing terminals of unequal size will reproduce speech as a receiver when voice currents are applied to its terminals. When one thinks of the similarity of the experiment in Dr. Gray's original observation, and of the electro-chemical, loud-speaking telephone of Edison, almost forgotten for so many years, one wonders how many other important truths are yet to be rediscovered by belated investigators.

TELEPHONE AMENITIES.

IT IS a great convenience—this talking over the wire. A third of a century ago the people of the enlightened nations had not gotten over their startled amazement at the feat of sending intelligent signals and communications along the telegraphic wires by electricity.

When, a few years later, they were told that men would soon be talking over similar wires and holding oracular intercourse by that medium, they thought it a joke, a sort of burlesque on the telegraphic service.

Nevertheless, it was not very long until even the worst skeptics were standing at the receivers and hobnobbing familiarly with far-away friends or exchanging small talk with the telephone girls; and they didn't think it a very mysterious circumstance, either.

To-day, the telephone service has grown to gigantic proportions, and is as indispensable as the telegraph, or the railway system, or the street car and traction service—or the postoffice, for that matter.

True, the telephone exchange is not without its drawbacks, but these incidental defects in the system are not so serious as to amount to an objection to the system itself, and everybody expects them to be gradually eliminated. The trend in all scientific lines, as well as in moral, social and religious lines, is toward perfection.

Let us not find fault, then. Let us be thankful for what we enjoy, since it is a vast improvement upon the tedious experiences of the past. Let us wait while we work for the finished product, the grand ultimatum, the Eldorado, which the great Independent movement is bringing nearer every day.

We relate a minor incident: A very busy attorney was conferring earnestly with a client in the former's office. The doors were shut and there was an understanding that all new conferees were to wait. There was to be no interruption, however urgent the business. Each caller was to wait his turn.

In the midst of the consultation the telephone bell rang suddenly and sharply. The attorney excused himself and took up the receiver. He talked a minute or two with the person at the other end of the line, then rang off. A similar incident occurred a little later on. Then the attorney, deeming an explanation in order, said to his waiting client:

"This is a feature of the telephone service that makes the lawyer or any other busy man feel like swearing. Someone calls at his office to confer—perhaps about some comparatively trivial matter—and finds him busy, with half a dozen other callers waiting. The person decides not to take his turn and goes out. He steps into some restaurant or store and, taking up the telephone receiver, calls the attorney, who, of course, answers—as he must. The interrupting person gets in his work and rings off. He does it while the first client waits."

This is a trick of the service and it can hardly be amended. Of course the lawyer might tell the man at the wire to call and take his turn, but there is the ever-present fear of offending a customer and driving him—or her—away. And certainly it would never do to refuse *her* an immediate hearing.

EDITORIAL ETCHINGS.

The telephone is the truest emblem of this swiftly flying age.

Telephone service when once had is as hard to do without as the proverbial "three square meals a day."

To quote facts and figures on Independent securities to a Bell agent is like shaking a red rag in a bull's face.

Because it is quick the telephone is peculiarly adapted to the needs and temperament of the American people.

The telephone, more than any other agency, has revolutionized prevailing methods in industry and commerce.

Long-distance conversations ceased years ago to be a novelty and are now a necessity of everyday business and social life.

Entertainment of all kinds takes form through the ministrations of the telephone, and friendships fuse in its currents.

One of the grandest achievements of the twentieth century is the triumphal march of the Independent telephone movement.

In a few minutes' talk by telephone matters can now be arranged which would require hours for settlement by telegraph, and days if the mails had to be employed.

Far more swift has been the progress of the art of telephony than ever has been recorded in any other industry, and none ever has had to face such peculiar, ever-changing, ever-expanding demands.

Telegraphy means a wait for a reply, while a conversation of a few minutes over the telephone does away with all waiting, and frequently settles matters of greatest financial and political importance.

The Automatic Problem

ARTHUR KNEISEL.

IN SPITE of the many articles written in favor of automatic exchanges there are still a few who seem determined to hold them down and to deny their possibility in the face of past success. F. V. L. Turner, in his article on this subject in the January TELEPHONY, is rather inclined to be radical. He attacks Kempster B. Miller for not telling him why the automatic "cannot be assumed at the present time to have reached a relatively high standard." This question might be answered as was the question: Why such crude apparatus in the early days of Independent telephony? Because the growth and perfecting of apparatus was hindered in every possible way by such as might be injured by its forthcoming. And had "the unequal degree of development of the two systems" strongly appealed to the purchaser and investor at that time, a small Independent field there would be at the present time.

The fact that "the larger interests have adhered to the manually operated board" does not necessarily condemn any other. The past history of the electrical field shows that many of its greatest and most valuable inventions went begging for capital and support. The Bell company may not have a good automatic to adopt, and besides, what need have they of working up one, when they can acquire the control of one of the largest Independent manufacturers after the disagreeable part of building up the business has been accomplished? Why not let someone else pay for the experimental work and trouble and take chances at getting control later?

Mr. Turner writes, evidently assuming that there is but one automatic system and that a central energy system is an impossibility. As to the automatic trolley car appealing to the average American, the automobile very satisfactorily answers the problem, and the automatic restaurant (to which he questions our consent) is not so distant, one being in operation in New York city.

Approached from a historical standpoint, it is easily seen that since the beginning of telephony the tendency of inventions has been toward automatic devices. The hook switch was perhaps the first of these. Then came the automatic shunt, which cut out the coils of the magneto armature from the circuit when not in motion. This was followed by the lamp signal instrument. At the central office the same progress has been going on. The relay, the self-restoring drop, the orderwire key and supervision between A and B operators are all steps toward automatics.

The common battery lamp signal multiple system was perhaps the greatest step in the direction of automatics. This system has been for years considered the highest type of development. It has many advantages over other systems and but few serious drawbacks, chief among which are cost, liability to errors and the fact that it is not secret. Cost of original installations is not such a disadvantage as the increasing cost of additions, for in the multiple system this increases as the square of the subscribers added. This is easily explained by an abbreviated description of such a board. This board is divided into sections of two or three positions each. On each section two or three hundred lines terminate in contact springs, known as answering jacks, and a jack for each and every line in the exchange appears in each section. That is, if an exchange has a capacity of 4,000 lines, each of these appears in every section. To make a 200-line addition to this type of board, it not only requires an addition of 200 answering jacks, but also 200 multiple jacks to each and every section, besides the installation of the entire number of jacks in one old section in the new one.

In a 4,000-line, two-position board a 200-line addition calls for $20 \times 200 + 4{,}200$ jacks, or 8,200 jacks. The next addition of 200 lines calls for 8,600 jacks more. The only purpose of this enormous number of jacks is to enable each and every operator to reach any and all lines in the exchange. This immense number of jacks being before each operator exposes the system to many errors, caused chiefly by false busy-tests, or carelessness on the part of the operator; and as many subscribers and all managers know, the only operator who will never listen in on a conversation is a deaf operator, who is of no value in the manual system.

To do away with the line multiple, several transfer systems have been devised, but none has been as great a success as anticipated. To eliminate the errors made by operators, various automatic systems have been invented. It might be well to mention here what is meant by an automatic telephone system. It is a system in which the subscriber, by means of a device located at his instrument, obtains a desired connection without the medium of an operator. Of these but four are noteworthy at present.

The first to demonstrate that automatic exchanges were a possibility on a large scale were those covered by the Strowger patents. In this system, connections are made by means of magnets. Besides a switch for each line, a percentage of second selector switches and a percentage of connector switches are necessary for the exchange end. The signal transmitter at the subscriber's station in this system is not latent—that is, it sends the signals as fast as each digit of the number wanted is brought into position. Compared with the multiple board the Strowger automatic does not reduce the number of soldered connections, but does away with operators' salaries and mistakes made by operators and insures a secret non-interferable connection.

The Bell automatic system can hardly be compared with the Strowger, as it has not been, to my knowledge, demonstrated as practical above 100 lines. In this system a station is called by inserting a plug into one of 100 consecutively numbered holes corresponding to the station numbers in a dial on the front of the subscriber's instrument and a lever pivoted in the center of the dial is brought around as far as the plug will permit. On releasing this lever it travels back to O, transmitting impulses in so doing, which are taken up by the central office mechanism and the connection made. In both the Strowger and Bell systems, the subscriber does his own ringing.

The next two are those of the American Machine Telephone Company and the Faller Automatic Telephone Exchange Company, both of which are a radical departure from the other two, as well as from the manual system, in that they are mechanical operators, run by power, controlled by magnet, which causes a connection to be started and completed even through the ringing of the called party, by connecting parts of the operator not in motion with such as are in constant motion; and again disconnecting them when conversation is completed. These are common battery systems entirely.

In the Faller system a signal transmitter called a "sender," measuring about $4 \times 4 \times 4$ inches, is placed at the subscriber's station. This sender has, in a system of less than 10,000, four loose rings placed in a vertical position, each ring having the numerals 0 to 9 on its peripherii. By revolving these rings in their plane any combination of

numbers from 0000 to 9999 can be set across the face of the sender. This sender being a latent transmitter does nothing until a knob on its right is turned about one-quarter of a revolution and released, when it starts the central office mechanism and in its turn transmits impulses according to the number set. This simple operation on the part of the subscriber can hardly be objected to, as it is no more than he has to do with the magneto system and he cannot forget to ring his party's bell, as this is done automatically. If he should forget to turn the knob on his sender, he would soon discover the fact, for the sender in transmitting impulses gives a whirring sound sufficient to be heard by the user of the instrument; and if the knob has been turned to its proper position it will be locked and remain so until the signal has been transmitted. An emergency button is provided, which on being pressed, connects the party with the trouble department at the exchange in case of trouble.

Automatic telephone systems have never received the encouragement due them from telephone engineers, who, for unknown reasons, were skeptical or were outright opposed to them.

The exchanges at Grand Rapids, Michigan; Fall River, Massachusetts; Lincoln, Nebraska; Los Angeles, California, and elsewhere prove that automatic telephony is not a failure, but a grand success. While automatic exchanges of to-day are perhaps not as perfect in their line as is the manual flashlight board in its, and while they will not do all their opposers would have them do, they show the most promising field ever opened to inventors in telephony. While at St. Louis I came in contact with many users of automatic telephones, and on being questioned as to how satisfactorily they worked the party would invariably testify to its success. Often they answered with very little hesitation and much enthusiasm, "Oh, much better than the Bell ever did." Sometimes I asked, "How good does that mean?" But they always assured me that the service given by the automatic was sufficiently satisfactory. I also questioned them as to the ease of operation and the liability for error. It was easy to learn the manipulation of the instrument, they said, and errors were seldom made, except through gross carelessness on the part of the subscriber. It seems that to decry the possibility of the automatic exchange is to deny the success of the modern printing press, looms, and shoe machinery, which have been in use for years.

THE TELEPHONE AND THE FIRE DEPARTMENT.

The service of telephone exchanges has been so greatly improved since the coming of the Independents into the field, and has become so reliable and certain in operation that the telephone has come into use as the most universal means of giving alarms of every description. In event of accident, the doctor, the ambulance or the hospital are summoned. In cases of disturbance the police are immediately called, but in case of fire the telephone has come to be one of the greatest safeguards ever known.

In the city of Chicago, as well as in all big cities, the telephone company or companies have special arrangements for handling fire calls. Main O in Chicago has come to be known throughout the entire city as the fire alarm number. It is not, however, necessary to know this number to give an alarm of fire. Indeed, in some cases, telephone users merely rush to the instrument and call out "fire" or say the house is on fire; the attentive telephone operator does the rest and the fire department is summoned.

In a report of a Chicago fire recently, it was stated that a cool-headed woman, detecting fire in the building, first informed the telephone operator, than woke up several families in the building on her way downstairs, and by the time she reached the door the chemical apparatus had arrived, the department was at work and the fire soon extinguished.

When an alarm is given by telephone, the exact location of the fire can be stated. The telephone alarm does not mean that there is a fire somewhere in the vicinity of the fire alarm box on some street corner, but tells just exactly where the fire is, the particular building and the particular floor, and in many cases the particular kind of a fire. The telephone is the only exact means of giving a fire alarm. The close and harmonious relations established between the fire departments in big cities and towns have been of great service in the giving of five alarms and in quick responses.

In the case of volunteer departments, or where departments are half pay and half volunteer, it should be certain that a telephone is located in the residence of every fireman so that he may be called. Such a call by telephone does not mean that the fireman is to rush out, not knowing where to go, but it may give him exact information of what is wanted and direct him to go to the particular place, where his services are needed, which perhaps may be within a short distance from his home.

In the city of Chicago alone there are an average of fifteen alarms of fire sent in by telephone each day. The telephone companies, in their modern and perfected service, are furnishing this invaluable means of handling alarms. The departments in every city and town should meet them half way, and, indeed, more than half way in this matter, and encourage the use of the telephone to systematize their employes in the method of handling the service, and also should keep in close touch with exchange managers and operators so that alarms may be transmitted with the greatest accuracy and speed. If it is possible in a great city like Chicago, it certainly is possible in every other city or town. In fighting fires the most modern methods and the best kind of up-to-date apparatus is constantly being introduced. Fires are best fought when it is made possible to get at them in the quickest way. Many minutes of time will be saved if patrons utilize the telephone in sending in alarms. Every fire department should have a close understanding with the telephone people of its city as to how alarms shall be sent in, and thereby increase its record for saving lives, homes and valuable property.

PRINTING BIG TELEPHONE DIRECTORY.

Another edition of the Washington telephone directory is now on the presses, says the Washington Star. Big publishing houses usually regard an edition of 200,000 or 300,000 copies of a book in which extreme accuracy in matters of typography is requisite as a big undertaking, even when every line of the copy has been written precisely as it is to stand before it goes to the printer. There are certain books, however, that are continually appearing in large and ever enlarging editions which are subject to almost innumerable revisions up to the last moment before the forms are locked and the great presses begin to click them off. These are the telephone directories—not, perhaps, literary productions of highest merit, but presenting certainly the most marvelous example of combined rapidity and accuracy known to the publishing world—a work which keeps presses running twenty-four hours in the day for several days before each issue, which depends upon the most careful system in an industry that owes its whole efficiency to system. Getting out big editions of popular novels or school geographies is mere child's play compared with the task of issuing telephone directories in our larger centers of population for a couple of million subscribers.

DIGEST OF TELEPHONE PATENTS

Conducted by Edward E. Clement

779,508—D. M. Therrell. Art of Electrical Wave Transmission.

A great many people appear to be working along the line of wave transmission circuits or in other words cable and long-distance lines, where distortion if not attenuation of high-frequency currents may be lessened or obviated. The subject is somewhat heavier than that of step-by-step devices for party lines, but its devotees seem to be quite as widely distributed. It is to be hoped that its literature will not become as voluminous, for obvious reasons. Mr. Therrell hails from Georgia, and he writes an able specification, reviewing the prior art and attacking the mathematical theory, showing also by frequent references to standard authority that he has studied the subject thoroughly.

It is not easy to brief this specification without mutilating it. I may say, however, that while others have been working to improve the conducting medium, Mr. Therrell has arrived at the conclusion that the problem should be attacked from the other side, and he considers how best to transmit the essential overtones or characteristic partials. The prime cause of the inability to transmit voice waves without deleterious attenuation lying in the human voice itself, whose characteristic partial tones and vocal noises are relatively feeble in comparison with the fundamental and lower partials, so as to be drowned out and lost, even in speaking, without special training (noting difference between children's enunciation and that of trained orators or singers), we should selectively reinforce such of the constituent partial tones as are essential to the transmission of the voice characteristics. In order to do this Mr. Therrell takes a series of concurrent voice waves and so arranges the phase relations of the series as to make them operate to reduce the fundamental and lower partial tones while increasing the upper partials or overtones. To use a common simile, this is like a wash-woman who, instead of using some preparation in the water to prevent shrinking entirely, provides that woolen garments will go in the water later and come out earlier than cotton ones, so that they would all shrink equally (if such a thing is possible). Of course this illustration is very far from accurate, but it rather roughly presents the point of view.

The apparatus is not claimed, but it consists in various direct and reversed connections of induction or repeating coils, and those familiar with the art can readily imagine how the various phase displacements are brought about. Incidentally, side tone is greatly reduced.

780,093—A. Ekstrom. Telephone System.

This is a composite system of a type pretty thoroughly exploited in this country. Given a common battery exchange, lines having mixed types of calling apparatus are brought in and handled all together. Long lines have magneto generators and local batteries at the substations. In the diagram herewith the station *A* is magneto, and the station *B* is full common battery. The former in calling energizes relay *20*, and lights lamp *24*. When plug *47* is inserted relay *25* gets current and puts out lamp *24*, being in series with lamp *51*, and the latter supposed to be shunted, so as to stay dark during the connection. When the subscriber hangs up a circuit is completed from the ground at the substation through coils *19* and *20*, the shunt referred to is broken, and the lamp *51* glows. The circuits are not entirely clear. If subscriber *B* calls the operation is the usual one in a common battery exchange, the cut-off relay *45* breaking the local lamp circuit and the supervisory lamp *52* remaining shunted as long as the line relay *43* is energized.

Mr. Ekstrom has assigned this patent to L. M. Ericcson of Stockholm, Sweden, where he lives. The scheme he presents is simply another proof of my theory that practically all the real development in telephony has been brought about in the United States.

780,439—J. K. Norstrom and H. M. Graif. Electric Circuit Closer.

This is a calling or sending device for automatic systems, intended to be placed at the subscribers' stations, and to require of the subscriber no mental exertion. It comprises a number of finger wheels, a clock train, contact springs worked by wheels, and interconnecting devices between the latter whereby they partly control each others' movements. In the well-known automatic electric sender, a dial with finger holes is provided on the front of the telephone. In the present case wheels with teeth, between which you put your finger, are set so as to project edgewise. Back of each wheel are the contact springs *25*, *26*, and on a frame is the pivoted dog *28* normally held in inoperative position and not affected by the wheel moving up past it in setting, but pushed down as to its upper arm by each tooth of the wheel in returning, so as to close and open the springs a number of times, corresponding to the number of teeth which the wheel has been turned forward. Each wheel has its own spring, and each wheel as it runs down trips the next wheel by means of a pin on its periphery and a detent lever controlled thereby. A common shaft passes through all the wheels and carries a ratchet *20* for each wheel, by which the shaft may be turned through engagement therewith of the pawl *21* as the wheel runs down. The last wheel has a cam which grounds one side of the line for ringing. The shaft is connected to the clock work mechanism, which suitably retards the motion of the wheels in running down.

780,525—C. D. Reeve. Telephone Dial.

The object of this invention is to provide means for illuminating the dial of an automatic transmitter or sender, and Mr. Reeve, the inventor, is from Grand Rapids, Michigan, where an automatic exchange is in successful operation. The apparatus chosen for illustration is the well-known desk set of the Automatic Electric Company. The greatest objection that has been found to the manipulation of the Strowger senders is that they cannot be handled in the dark. This is met in the present case by providing a little window opposite each finger hole, and painting the numbers on translucent material in these windows. Behind the windows (marked *11* in Fig. 1) a miniature incandescent lamp 5 is located, its circuit being controlled by the switch-hook and the calling button jointly. When the receiver is taken off the hook for the purpose of calling, the

lamp circuit is closed; and when the calling button is depressed this circuit is opened. The mechanism employed is merely the usual combination, with an extra lamp contact for the hook.

780,601—W. W. Dean. Central Energy Telephone System.

This patent, assigned to the Kellogg Switchboard and Supply Company, is one of the fifty-seven varieties of chow-chow circuit for all tastes which Mr. Dean served up during his connection with that company. It comprises an ingenious arrangement whereby the battery is connected in series with two lines when plugged together for conversation, but talking currents do not follow the same path, the usual repeating coil being employed.

In the diagram herewith *h* and *k* are supervisory relays which, together with the apparatus they control, need no specific description. Plug seat switches are employed, or rather are shown, for normally opening the circuits of the supervisory lamps *m'* and *v'*. The main battery *r* is connected in parallel to all the cords in series with the two halves of one side of each cord. Thus in the figure, the battery is shown connected in series with the tip strands *t* and *t'*, and also in series with the quarter windings *w2* and *w3* of the repeating coil. One side of the battery is wired to the condenser *l'*; and from the other side of this condenser a wire *3* is connected to the quarter windings *w4*, *w5*, of the repeating coil. The battery current flows as follows: *r, w3, t', o', d', a, f2, 8, f, f', a', d2, o2, s', k, w5, w4, h, s, p2, d2, a', A, a, d', p', t, w2* and back to battery. Subscriber *A* talks over the following circuit, or rather the variations produced in the transmitter of subscriber *A* cause corresponding current waves to be propagated in the following circuit: *f, 8, f2, a, d', p', t, w2, r, l', 3, w4, h, s, p2, d2, a', f'*. Similarly, changes in the transmitter of subscriber *B*, and also current waves originating in the circuit of subscriber *A*, cause corresponding waves to be propagated in the following circuit: *f, 8, f2, a, d', o', t', w3, l', 3, w5, k, s', o2, d2, a', f'*. Thus there are three circuits, one continuous series circuit for the battery and two separate talking circuits repeating into each other.

780,679—F. R. McBerty. Apparatus for Telephone Switchboards.

This is a system employing common battery and the well-known Bell standard type of relay circuits, the ordinary ringing and listening key being omitted from each cord and a magnetic key substituted, one common selective key being used for all the cords on one position. The root idea of the scheme is simple. It is to have a relay in circuit with the answering plug to connect the operator's telephone and the ringing generator and another device controlled by an act of the operator to take them off. In embodying this idea, a double wound relay is employed which draws up its armatures upon current passing through one winding, and holds them up until current passes through the other winding, when the magnetic effect upon the core is balanced and all bets are off. This being Mr. McBerty, and the patent assigned to the Western Electric Company, the circuit should perhaps not be criticized, but, nevertheless, this management of the relay *p* does not embody the very best practice. Differential relays are never quite satisfactory, and particularly not when neutralization must be depended upon under conditions of maximum magnetic efficiency.

However this may be, the operation is as follows: When the answering plug is inserted in a jack, the ringing and listening relay *p* gets current through the cut-off relay branch and the third strand of the cord, pulls up, breaks the through cord circuit, connects the operator's telephone to the answering plug, and puts the bus wires of the generator on the calling plug. No test is provided, probably having been overlooked. When the calling plug is inserted the second winding of relay *p* would get current, but this winding is shortcircuited as soon as the armatures are pulled up, the shunt passing through wire *11* and supplemental contacts *r'* on all the selective keys. It should be stated that the scheme is specially adapted for party line systems, wherein one set of selective keys can be employed for the entire position. The bus wires *9-10* from this set of keys pass to the various cord relays, and as soon as a calling plug is inserted, the selective key being set, the proper current is sent out to line for calling the desired station. The keys have this peculiarity, that each one has a pin that when it is depressed to the limit strikes a stud on the side of a rocking spindle controlling the supplemental contacts *r'*, opening the latter and thereby opening the shunt around the second or disabling winding of the cord relay *p* in any cord in use and connected to that set of keys. Thus the operator can direct proper current to line and then by merely pushing down hard on the key can clear the cord and complete the talking circuit. The shunt once broken, current flows through the balancing winding of the relay *p*, and the armatures fall back, if they do not stick up by accident, and, as before stated, all the auxiliary apparatus is then off.

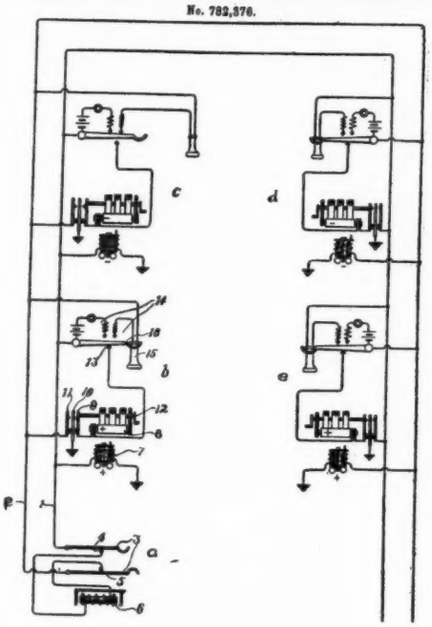
780,713—A. Eckstrom. Signalling System in Telephone Plants with Central Battery.

This is another system by the Swedish gentleman belonging to the Aktiebolaget L. M. Ericsson & Co. The title sufficiently indicates the nature of the invention, and I need only state its functions. When the subscriber takes down his telephone he closes a path through the line relay for battery current from central, as usual. The cut-off relay is double wound, the middle point of the windings connected to the test ring of the jacks, one end to the ground and the other end to the armature which in series with the armature of the line relay controls the line lamp *S1*. When the answering plug is inserted current flows through the supervisory lamp branch and the jack test ring to one winding of the cut-off relay and ground. This relay is then energized, and the supervisory lamp is shunted, the cut-off relay holding up by reason of a preponderance of current in the one winding as long as the line relay is energized. When the subscriber hangs up the line relay lets go, the cut-off still holding up, and current then flowing through the supervisory lamp in sufficient quantity to illuminate it.

781,001—P. C. Hewitt. Means for Amplifying Electrical Variations.

Nearly everybody has heard and read about the Cooper-Hewitt lamp. One of our esteemed contemporaries in a recent issue announced an article about this lamp as a telephone repeater. The title was all that materialized, but the article doubtless would be interesting, if printed. In a former patent Mr. Hewitt presented his lamp as a resistance varying means controlled by a magnet, which in turn responded to changes in a primary circuit, the lamp tube being included in the secondary circuit. In the present case, the lamp *5* is included directly in a transmission circuit containing a battery *1* (or other source of current), a telephone transmitter or the like, *3*, and a receiving device, *4*. As set forth in the patents of September 17, 1901, attention is called to the fact that the resistance of an inclosed vapor or gas carrying current in an electric circuit varies inversely with the current carried. Accordingly, if a varying potential be applied to an apparatus like the mercury vapor lamp, a variation of current takes place in the enclosed vapor, and this variation of current will affect the entire circuit in which the apparatus is included, and if the resistance of the vapor apparatus represents a considerable portion of the total resistance of the circuit, the variations of current may be caused to produce comparatively large variations in the entire circuit. This statement of theory

No. 782,376.



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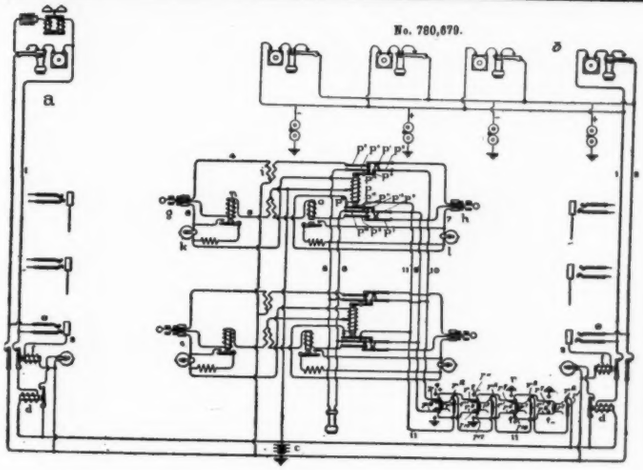


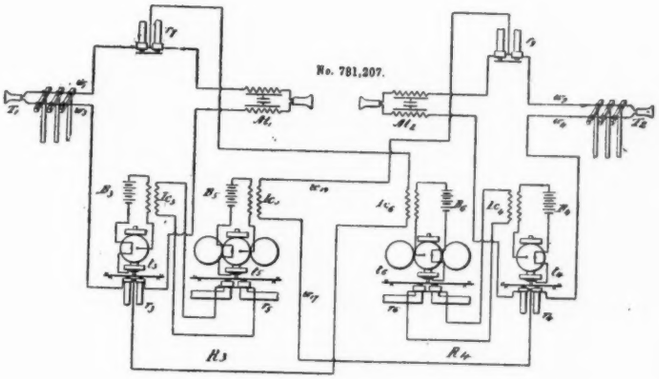


Fig. 1.

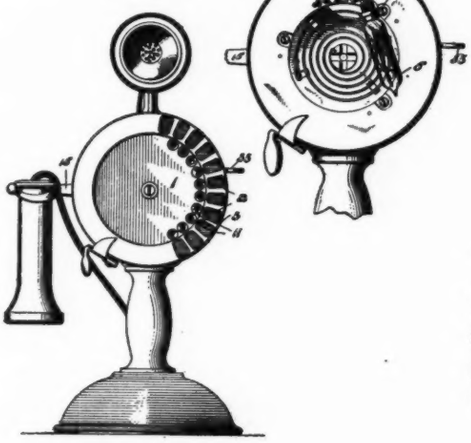
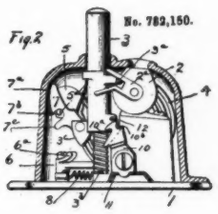


Fig. 2.

No. 780,525.

Fig. 2

No. 782,150.



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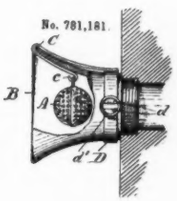

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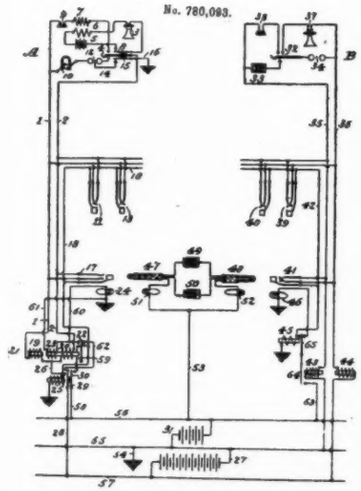

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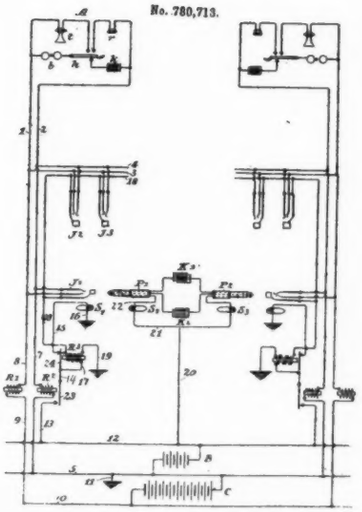
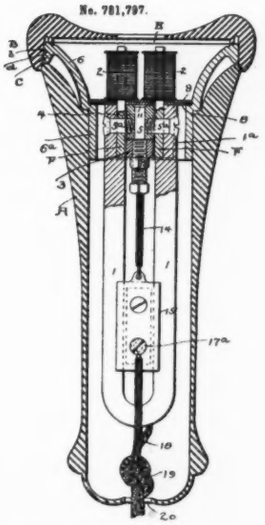


No. 781,797.



sounds very well, and it may work out in practice, but translated into plain English it means that the mercury vapor tube, if included in circuit with a transmitter, will follow the variations in resistance of the latter with variations of its own on an exaggerated scale. In order to make this produce any marked effect in the circuit, the resistance of the tube, or rather of the vapor, must be very high relatively to the rest of the circuit.

The title of this case would lead one to believe that there was some amplifying of current; but this is not so, the amplification being in the changes of resistance, and hence in the changes of potential initially impressed upon the circuit. In other words, this is not in any sense a repeater, but merely an improved transmitter.

781,002—P. C. Hewitt. Method of Amplifying Electrical Variations.

This case contains the method claims applying to and covering the apparatus described in the foregoing paragraph. The patent office practice requires method and apparatus to be presented in different applications.

781,181—W. K. Brackett. Disinfectant Holder for Mouthpieces.

This is a tea-ball or cage containing a disinfectant and hung inside the mouthpiece of a transmitter on the hooked end of a clip secured to a split ring clamped on the outside of the mouthpiece.

781,194—L. V. Elliott. Automatic Code Ringer for Magneto Signal Bells.

This is a ringer for party lines, particularly rural lines. A slot is cut in the front of the box and in this works the button with a pointer which can be moved across opposite any one of a row of names representing the stations on the line. The button carries on the inside a contact, which, when it is set selects a particular one of a series of code wheels, all these wheels being on a common shaft geared to the main spindle of the magneto generator. Hence, by setting the button opposite the name of the wanted party, and then turning the crank, the calling current is generated and is sent to line in a series of intermittent rings regulated by the particular wheel selected, which turns slowly as the generator turns rapidly. Correct signals are thus given without special knowledge or care on the part of the subscribers. The sending wheels are essentially like the make and break wheels in fire alarm telegraph boxes.

781,207—W. W. Jacques. Telephone Relay.

In the October number of TELEPHONY I digested patent No. 767,818, issued to Dr. Jacques for the so-called "ladder circuit," having nickel-plated copper wires bridged by non-inductive shunts at recurring intervals. The invention in that case was intended to prevent "distortion," that is, the twisting of voice waves so as to destroy the clearness of articulation. In a distortionless circuit, however, as in all telephone circuits, there is a gradual attenuation or weakening of the telephone currents as they pass over the line. On very long circuits this attenuation becomes serious in its ill effects, perhaps to the extent of prohibiting conversation at all. Dr. Jacques says from calculations of the attenuation at given points on given distortionless circuits, it appears when the current received at the end of a 1,000-mile circuit has 1-150th of the original intensity (which will still give good commercial conversation), the enfeebling effect over 2,000 miles pulls the intensity down to the small fraction of 1-22,500th. This makes the waves so feeble that conversation is quite impossible. If, however, at the end of 1,000 miles the current can be restored to its original intensity, and so on in links of 1,000 miles, good results could be obtained at very long distances. In other words, relays must be employed, also known as telephone repeaters, but this not very correctly, unless a coil is employed.

The telephone relay has received considerable attention since the beginning of the art, and this very naturally, since it was the relay which made telegraphy a commercial possibility. In the telephone art, however, we have in the receiver an instrument so sensitive, and we are dealing with forces so complex, that neither the necessity nor the possibility of a real telephone relay have been apparent until quite recently. We have already gone far beyond the limits set by eminent theorists years ago, and at last, with all the sensitiveness of our receivers, and all the improvement in our line construction, we have reached the limit of straight transmission, and that principally owing to the same old weakening of the current. Granting that anyone wishes to talk across the Atlantic, and that a cable may be designed which will not hopelessly distort the waves, a circuit 3,500 miles long (which would be above the average with terminal lines) is entirely too long, unless the currents can be relayed or boosted in some way.

Dr. Jacques here presents a relay scheme which in its theory is reminiscent of the attacks that have been made upon the line theories. He makes a relay which he says gives perfect satisfaction, and which he calls a compound relay, by taking two simple relays and combining them, so as to produce a resultant effect. The mechanism itself is as follows: Upon a springy pad adapted to deaden any vibration rests a heavy iron plate. Upon this are mounted two posts, each with a bracket arm and each having suspended from its arm a weight with a microphone button of the White type attached to it. Upon a sliding block is mounted a receiver with the usual small diaphragm and sensitive in action, which is pushed up into like contact with one of the microphones, a single weight only being attached to this. The adjustment is such that the contact between the receiver diaphragm and the microphone stud is very light, and this relay is very sensitive, magnifying greatly, but also distorting to some extent.

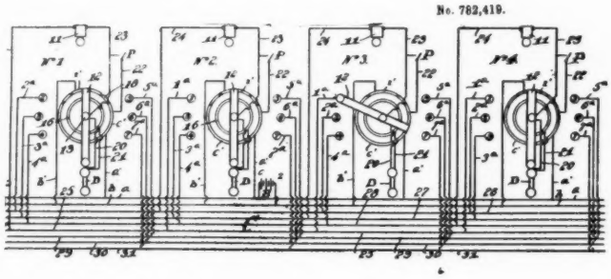
Mounted on a similar block is another receiver, having a large diaphragm and heavy parts, the diaphragm being strongly pressed against by the stud of the microphone, and the latter being very heavily weighted. This relay is not so sensitive, and while it distorts somewhat, this tends to correct the distortion of the first. In other words, the sensitive relay magnifies the overtones disproportionately, while the heavy relay magnifies the fundamentals, and by connecting them in tandem these effects are combined so as to produce a resultant current on the outgoing line corrected to correspond with the original current and magnified as to intensity.

In order to prevent repeating back, when a two-way circuit is employed as usual, Dr. Jacques has recourse to the same expedient used in telegraphy; that is, he connects an artificial circuit in parallel with the line circuit at the relay station, and connects relay magnets on each side differentially, that is, with one-half the windings in the artificial and one-half in the line circuit. The microphone of each relay has its connection across to points between the windings of the other relay, so that only incoming line variations will affect either relay. In the diagram herewith, *T'* is one terminal station and *T2* the other. *R3* is one compound relay and *R4* is the other. *Al'* is one artificial line, and *Al2* is the other, each having capacity and self-inductance and shuntage the same as its corresponding line. *r7* and *r8* are dummy telephones used to balance.

781,225—J. L. Peavey. Rent Collecting Means for Telephone Service.

The drawings in this case seem to have been made from working apparatus, and the design is fairly well worked out. The figure presented herewith is only one of fourteen tak-

No. 782,419.



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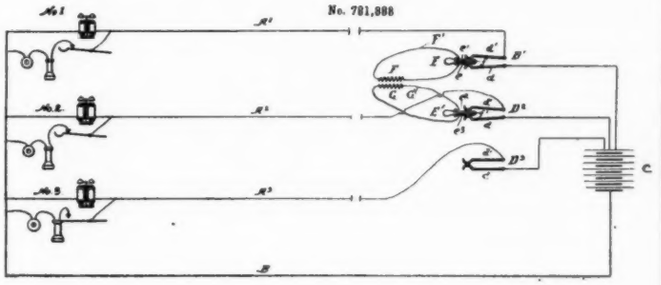

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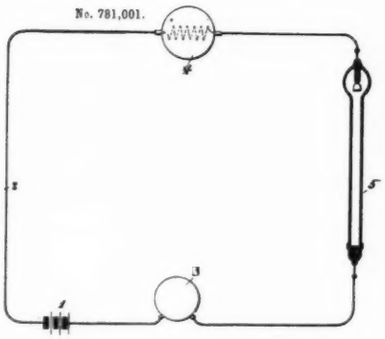
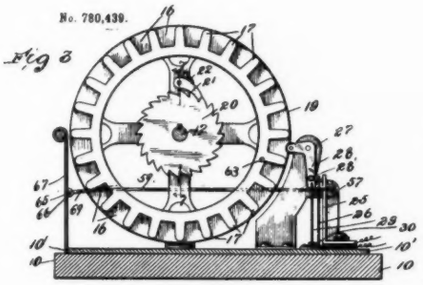
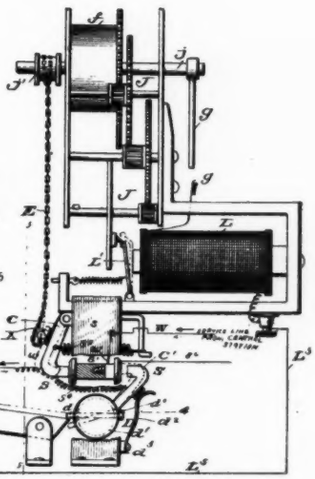


No. 780,439.

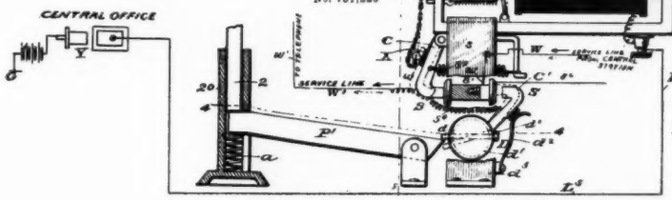
Fig 8





CENTRAL OFFICE

No. 781,225



No. 782,323 Fig. 2

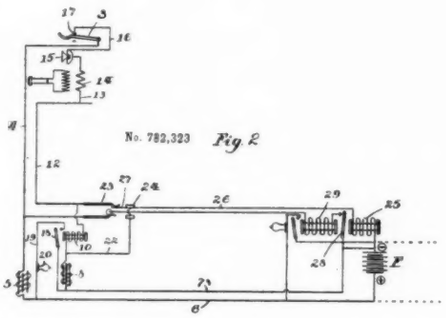
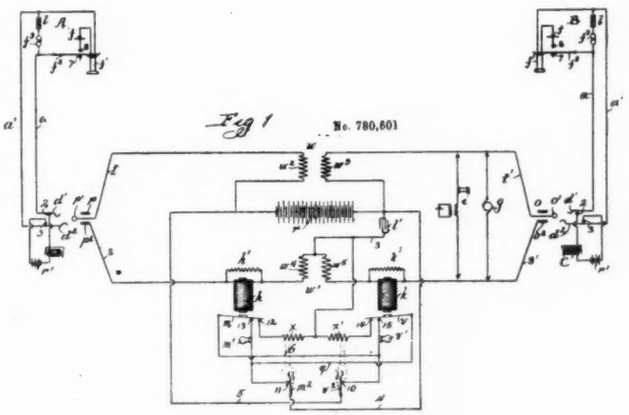


Fig 1

No. 780,601



A

B

No. 782,382 Fig 1.

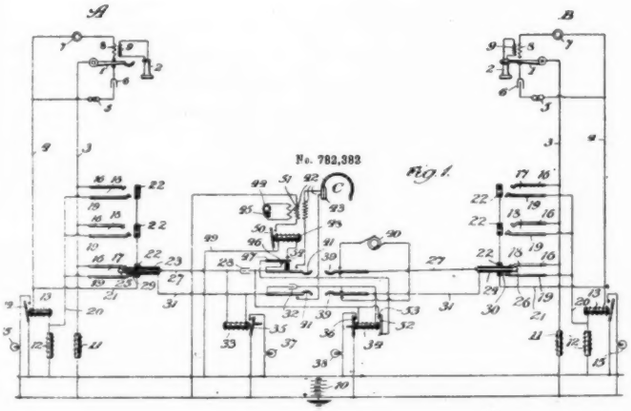
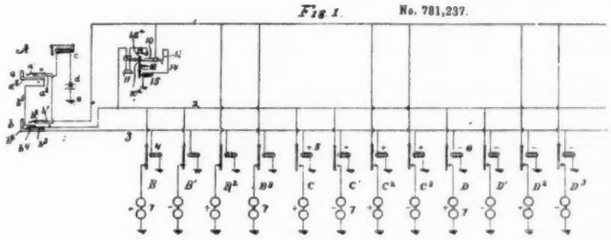


Fig 1. No. 781,237.



ing up nine sheets of drawing. The basic idea may be stated in a few words. Mr. Peavey wants a short cut to collection, without the usual force of people, and he adopts at once a club without any stuffing. He provides a device at each station whereby the telephone is cut off at the end of a month or other period and remains cut off until the rental due is dropped in the box. The cut-off is worked from central, and the reconnecting device is coin actuated. After once reconnecting by paying up, the device cannot again be disconnected from central until the collector has been around and reset all the mechanism.

In the figure herewith, the subscriber's telephone is connected through wire *w'* to the service wire *W'* and so to central through the switch arm *w*, contact *s'* and wire *s6*. A branch from the service wire presumably is taken to the magnet *L*, whose armature *L'*, normally retracted, holds the clock-work *J* inactive. An impulse from central through the magnet *L* starts the clock-work, which winds up the chain *E* and pulls the arm *w* away from contact *s'*. This disconnects the telephone. The subscriber can drop in his money, however, and by means of co-operating levers or studs worked by the coins he can unlock and depress the lever *P'*, to trip the rock shaft *D*, whose spring *d2* throws up the arm *S* against the contact *s'*, thus reconnecting the telephone, since the arm *w* and *S* are connected through wire *s6*. The machine cannot again be disconnected from central until the collector has come around, wound up the clock-work, and reset the rock shaft.

781,237—C. B. Smith. Telephone System.

This is a many-party line scheme in which a separate wire is used from which relays are tapped off to ground at all the stations, these relays controlling the ringer branches off the main pair of conductors. Twelve stations are shown. The extra wire is marked *3*, and the groups of relays are *4*, *5* and *6*, the first responsive to current of either direction, the second to currents of plus sign only and the last to those of minus sign only. The neutral relays break their ringer circuits when energized, while each of the other groups makes its ringer circuits. Thus, to ring any desired station current of the proper sign is sent over the extra wire and over one or the other side of the line circuit as usual to ring.

781,385—S. E. Williams. Sanitary Attachment for Telephone Transmitters.

According to this invention a holding ring is stuck on the edge of the mouthpiece, and then a piece of paper crimped up till it looks like a miniature flower-pot is stuck bottom first into the opening. It ought to be cheap, and it may be efficient. If so, it is a good thing.

781,625—J. S. Stone. Method of Protecting Telephone Circuits from the Action of Electromagnetic Waves.

Wireless telephony and telegraphy have disturbed transmission of the other kind about as much—or as little—as the unseen spirits of the circumambient ether disturb gross mundane operations in general. In the first place magnetic waves are horizontally polarized and of a frequency of the order of 10^5 or 10^6, as employed in space transmission. In general they have no electric component parallel to the earth's surface and no magnetic component normal to the earth's surface, and to put it in plain figures, their frequencies are from 100 to 1,000 times the telephonic frequencies in wire circuits.

Properly constructed underground lines are not affected, moreover, because of lack of penetration by the waves. There is one way, however, so Mr. Stone says, in which overhead lines can be affected, and that is in common battery systems the charge on a pair of wires may raise their common potential high enough to cause sparking at the lightning arresters and so start current leaps which would cause sounds. In order to prevent this, Mr. Stone grounds the circuit wires through capacities too small to short-circuit the voice currents. One is tempted to speculate as to which is the more remarkable in the way of invention, the disease or the cure.

781,188—I. Kitsee. Telephony.

Dr. Kitsee has here introduced the induction coil into the original circuit of Chichester Bell, whose patent recently expired. A common battery feeds separately into branches of the subscribers' lines through the jacks, and all the lines are bunched onto a common return on the other side. In connecting two lines, the patentee inserts one side of a repeating coil into one line branch in series, and the twin coil in the other line branch, instead of simply connecting the lines direct. I cannot see the patentable novelty or usefulness in this, but perhaps I am obtuse and short-sighted.

781,797—A. R. Thollander. Telephone Receiver.

This has the metal cup carrying the magnet structure, like the Burns and North receivers, also like the new Dean receiver, but in the present case the magnets are adjustable upon the cup. An extension or neck *6a* has a cross or bridge piece *3*, over which the magnets are held by the cross-block *4*. An adjusting screw is tapped into the bridge *3* and is secured to and carries the block *4*. Suitable locking means such as a nut *13* holds the adjustment.

782,150—G. A. Long. Telephone Toll Register.

This device is one of several, the patents for which are all assigned to the Gray Telephone Pay-Station Company of Hartford, Connecticut. In each case a small box is provided containing a gong and a register, with a push button or plunger for working the register and ringing the gong as it does so. In many cases, however, slight derangements of the apparatus have permitted the register to be worked without sounding the gong, causing annoyance to the subscriber, whose word the operator is forbidden to accept, her official knowledge of the registering act being based only upon the sounding of the gong as she hears it. By the present invention it is impossible to work the register first. The gong hammer is locked and unlocked and the register arm thrown down and worked in reverse and consecutive sequence, by the insertion of suitable dogs and pawls.

782,323—D. W. Campbell. Telephone System.

This patent is assigned to the Vought-Berger Company of LaCrosse, Wisconsin. It presents a common battery multiple board system, having lines permanently connected to the battery through choke coils, the line circuit being a three-wire circuit and the cord circuit two-wire. When a plug is inserted it short-circuits the line jack, but leaves the impedance coil in.

In the cord circuit, the four-relay problem is solved by having the relays *25* on the tip side control the circuits of the relays *29* on the sleeve side, these in turn when energized closing the supervisory lamp circuits. Thus, instead of having two relays jointly controlling a lamp, one relay controls another, which controls the lamp.

782,376—G. Babcock. Four-Party Line Telephone System.

In magneto systems this patentee states it has been necessary to provide a marginal adjustment between the subscribers' ringers and the central line drop, in order that the subscribers would ring in to central only, while the operator with strong current could ring out. Mr. Babcock, who assigns to the Stromberg-Carlson company, provides for two ringers tapped off from each side of line to ground and responding to plus and minus current respectively.

Each generator is adapted to give current of the proper sign to work its own bell only, and each generator has an automatic circuit closer on its shaft, which put a dead ground on the other side of line from its own ringer when in use. It will be noted from this that it follows that when station A calls its own bell will ring, but none of the others, because those on the opposite side of the line are shunted, and the other bell on its own side of line does not get the proper current. Under these conditions every generator can be made good and strong so as to be positive in action.

782,382—W. M. Davis. Telephone Exchange System.

This is a multiple board common battery system intended to be "clickless." In testing, the tip of the testing plug is cut off from the cord and connected to a test relay *48*, through the key *47-39*, and the tip conductor *27*, the cord being broken at *46*. Talking current is supplied to each line through the choke coils *11-12*, and the line relay *13* is restored on plugging in by shorting it through the jack thimble and long spring. The test circuit is somewhat curious, inasmuch as no current is fed to line through the cord at all. If a line is busy, the circuit comes back through the tip, through the test relay and to one side of battery, the other side being connected back through the line choke coil *11* of the busy line, to the tip of the plug already connected, and thence by the following path: Through the cord and its keys from tip side back to sleeve side and through the line choke coil back to battery. The circuit is operative.

782,419—W. H. Rose. Intercommunicating Telephone Switch.

This is really a switch, but it is useful only in connection with the standard intercommunicating circuit, in which, as usual, each station ringer *11* is connected to its individual wire in the cable, and by turning the switch around the home station apparatus may be connected to any other desired station through the home wire thereof. The switch comprises an arm *12* having its short end sweep over concentric segments connected with the local talking and ringing circuit in proper order and its long and reaching out over individual contacts connected to the other stations. When the switch is set on any of these its short arm necessarily makes the proper local connections for its own telephone. A stud on the end of the long arm supports the combination transmitter and receiver D when not in use, and its weight keeps the switch arm properly vertical.

782,562—M. Hitt. Telephone Register.

Mr. Hitt is from Los Angeles, California, and his invention is very ingenious, although simple. It is a directory mounted on a roller pivoted to be turned around very much like those upon which our kitchen roller towels are hung. The names are printed or written in alphabetical order on a long strip of paper which is wound around the roller spirally and fastened thereto. By simply turning the roller the names can be read off, as they are on lines parallel to the axis of the roller.

CAN THIS BE POSSIBLE!

A St. Louis publication, *The Mirror*, recently paid the following compliment to the Bell company, which operates in that city: "Worst of all nuisances in the city of St. Louis is the Bell Telephone Company's directory. It is snide, flimsy, rottenly printed, inconvenient in size, ill-arranged—utterly disgraceful to the corporation issuing it, and to the city at large. Manager George F. Durant should be arrested, charged with conducting an indecent publication."

PRESERVING TELEPHONE POLES.

In all timber-consuming industries experiments are eagerly prosecuted with a view to discovering methods of preservation. The increasing cost and growing scarcity make the durability of timber a matter of great importance. American railways have been seeking methods of prolonging the life of cross-ties, and the telegraph and telephone companies are pursuing similar investigations with regard to standing poles. The American Bureau of Forestry at the present time is engaged in an experimental study to increase the durability of telegraph and telephone poles. The interest in this matter taken by the government promises an important forest economy through the possibility of using much smaller trees than are now cut for poles. This means a new market for these smaller trees, liberating the larger ones for other uses.

The length of service of a telegraph or telephone pole is determined in a section of the pole not more than a foot or a foot and a half long. In a standing pole this section extends about six or eight inches above and below the top of the ground. This is the universal point of attack upon the life of the pole, and is called its breaking point. Decay soon girdles the pole and gradually eats into it deeper and deeper until it is so weakened that it breaks under the weight of its equipment. The strain upon the pole from wind pressure and the weight of its cross-arms and wires is calculated for the ground line. When the diameter of this ground line is constantly decreased, the strength of the pole is proportionately reduced, and it becomes only a question of time when the pole must fall. White cedar has been found the most durable among available timbers, but the life of a white cedar pole is estimated at from twelve to fifteen years.

The telephone and telegraph companies of the country use millions of poles on their various lines, and it would be a great economy to add even a few years of service to the life of each pole. But there will be another large saving both to them and to the forests through preservative treatment. To provide a good margain against decay, poles are now much larger than demanded by the strain upon them. When it is known that decay, in a certain number of years, cuts the diameter from perhaps twelve to eight inches, and that below eight inches the weakened pole falls, the course to be pursued is obvious. Preservative treatment prevents for the time of its effectiveness the starting of decay, and thus permits at the outset the selection of an eight-inch diameter rather than a twelve-inch. The four inches saved represent a great difference in the size and age of trees used for poles.

Both the companies and the owners of forests will be of great gainers by this economy, with its shortening of the length of time necessary to grow a pole. Experiments already made by the bureau show conclusively that poles can be subjected to a preservative treatment which insures materially lengthened service. This treatment consists in impregnating the wood with antiseptics which prevent the growth of the fungi that cause decay. For telegraph and telephone poles only about one foot of the entire length needs to be made immune from decay. If this foot at the ground line can be preserved the rest of the pole will take care of itself. Experiments will be made in treating the butts of the poles for a distance of about eight feet, thus carrying the antiseptics just beyond the zone of decay attack. The creosote method will be used, and dead oil of coal tar forced through the butt of the pole. Prolonging the life of poles need not necessarily prolong the pole nuisance in cities, for the pole will be a necessary part of rural equipment during the measurable future.

Telephone Line Engineering

C. J. H. WOODBURY

THE wonders of the telephone as the most subtle of physical apparatus, yet so simple as to be the only electric device operated without skill—an invention without precedent, which also has never been improved—have worthily been the theme of frequent portrayal, which exposition of the telephone also has been devoted to the concentration of applied science upon the switchboard and the transmitter, each of which is an essential adjunct in the development of the telephone system.

The salient characteristic which justifies all commercial applications of electricity, except those of industrial chemistry, is that it overcomes the impediment of distance; and it is essential that the conductors spanning these long extents, free from direct supervision, shall be as permanent as possible in order to maintain conditions of constant service.

The amount of capital amassed in the millions of miles of line construction throughout the country is of itself a warranty as to the importance of the subject; while the rapid depreciation to which most of this property is subjected requires both technical skill and business judgment to decide upon the most judicious methods of construction, amid varying circumstances of natural conditions and commercial use, in order to reach the most economical point of investment.

Analyze the general problem as one may, and standardize the general methods to cover a wide range of circumstances, yet there are exigencies and varying conditions which require the exercise of that type of constructive engineering which "does things." "The picture is first rate, but we built the bridge last night," said the Maine lumberman in the army to his West Point commander.

The application of mathematical principles is essential to any constructive work which is not merely a repetition of precedents, and the ordinary precedents of safe construction have been established upon the wrecks of past failures, perhaps for generations agone. In this paper it is proposed to submit some of the difficulties which have been met in line construction and the manner in which these obstacles have been overcome, as well as ordinary methods of standard construction.

The increase of every commercial application of electricity to meet the demands to supply service to patrons has been so great that an essential portion of every problem in constructive electricity must take into consideration provisions for future growth, as well as the inevitable depreciation.

POLES.

Although forty-five per cent of telephone wires are on poles, the total extent of the pole lines exceeds the length of the underground conduits, as the latter are used only in cities where the conduits contain a greater number of lines, to reach the concentration of patronage.

Typical methods of setting poles will first be touched upon. Where the soil is not firm enough to sustain a pole imbedded in the usual manner, security may be obtained by extending the supporting area by plank at the bottom of the excavation and filling the hole with concrete, or braces may rest upon a platform placed on the surface of the ground, and in some instances these platforms rest upon piles. In other instances these braces rest upon plank placed underground, or, in place of a single pole, they are placed in pairs, either vertical or joined at the top and connected by strong wire at the ground, making what is known as an A pole. When the line changes its direction, or there are other causes to make a lateral pressure against a pole, it is secured by braces or guys, either running to an anchorage in the earth or to some other object.

When a telephone line is built in or near cities, the proximity to supplies and labor renders that portion of the work comparatively easy, but in the construction of long-distance lines, connecting various cities, town and villages, it is necessary to provide means for the execution of the work on an independent basis.

In a suitable locality, a camp consisting of a number of tents is pitched, one of them being a dining tent, another is where the cook holds sway, and still another the engineers' tent, where such details as must be left until the work is in progress receive attention, while several tents for workmen are necessary. If the route runs through a wooded country, a wide swath is cut in the forest and the postholes may be made by the diggers. In other instances a charge of dynamite deposited in an augerhole makes quick work, the greatest relative gain being in compact clayey soil.

Meantime the poles have been brought to their sites by teams, and then moved into place by the help of an axle mounted on a pair of wheels, termed a "dinkey;" gains are cut and the crossarms attached before they are raised, either by all hands with pikes, or if the country is not too rought to permit, a portable derrick mounted on a wagon is drawn to the site, then the horses are taken from the pole and set to pulling at the rope, quickly raising the pole. Then the derrick wagon is drawn to the next pole and the work proceeds rapidly.

When the line changes in direction, the pole is rendered more secure by guys and the pole line is ready for the wires, which are payed out from a number of reels in a wagon, thence passing through a set of guiding holes which prevent snarling. The final attachment of the wires to the insulators on the crossarms is very carefully done, because it is necessary that the wires should be drawn to an extent where they will not sway against each other, and yet not so tightly that the contraction in cold weather would put a stress on the wires, causing danger of breakage, for at these small dips in the wires a slight difference in the length of the line will cause a great variation in the stress.

The stresses to which a telephone pole is subject are the result of many and variable combinations of live and dead loads upon a beam fixed at one end and loaded near the other end. There is scarcely anything in engineering construction so actively the subject of depreciating conditions. The top is exposed to the weather, and the important section near the surface of the ground is the portion most energetically attacked by decay. The wood is assailed by animal life, whether it be gnawing by horses in town or perforation by woodpeckers in remote districts. Poles in wild countries are bitten by bears in search of bees, whose humming is imitated by the vibration of wires, and it is said that in India the tigers use the poles to sharpen their claws upon after the manner of their second cousin, the domestic cat, but with such strenuous vigor that the poles become weakened. Not only are they wrecked by storms, but freight-car roofs frequently fly off and strike the poles edgewise with destructive results.

Iron poles are but rarely used in this country, the principal condition governing their selection being that on some lines in prairie countries in the west, where campers are

Paper read before the Franklin Institute, Philadelphia.

prone to cut down wood poles for fuel, tubular iron poles have been substituted. In Europe iron poles are largely used, and in tropical countries infested with white ants it is necessary to use iron poles or to attach the wires to living trees.

Antiseptic methods for treating poles as a preventive against decay and the attacks of insects have not been so general in the United States as in Europe, as the relatively sparse settlement and distances between cities would make the transportation of poles needing treatment to and from the sites where they are to be used a prohibitive expense. However, poles treated by creosoting have been used in this country wherever transportation conditions between the sawmill, the treating plant and the sites where they are to be used will permit. These conditions apply to certain portions of the south, where southern pine is sawed to dimensions and then treated.

As the cost of this treatment is based on the volume of the timber, these poles are sawed to such proportions of taper as to give the most economical volume of timber to resist the stresses the pole is subjected to. The breaking point of these poles, as computed, is from eight to ten feet above the ground.

While gravelly soil will hold a pole to the limit of its strength, it is necessary to build lines in many places where such conditions do not occur. The New Orleans and Mobile line, along the north shore of the Gulf of Mexico, traverses marshes composed of soft mud which extends to a great depth, upon which a rank sedge grass grows twelve to fifteen feet in height, whose coarse roots form a compact mass about a foot in thickness. In order to prevent this line from being injured by the fires which rage among these marshes in the early spring, the grass is kept cut to a width of one hundred feet along the route. It has been possible to sustain poles along this route by bolting heavy cross pieces across them at the ground level, having cut an opening among the roots through which the butt of the pole can be inserted, and then the pole is braced as occasion may require, sometimes in four directions, each of these braces being supported on a cross piece at the marsh level. In some instances a pair of, or even three, poles are used, each being attached to the same cross-arm.

At the Tybee marshes, near Savannah, Georgia, the ground is so soft that it cannot be walked upon, and the men engaged in building the line were obliged to lay a line of boards to proceed along the route. When a pole was to be set, cross pieces were temporarily attached to it near the lower end, and men standing upon these supports "jounced" in unison while the pole was held vertically by pikes. Under this human pile-driving, the pole sank rapidly, the mud being so adhesive that in a short time the pole was securely held.

Similar methods are used in building the lines across the New Jersey flats, although the conditions are not so severe as at some places farther south. When the ground is too wet and soft to permit digging, poles are frequently set by hewing their butts to wedges, and while the pole is held in a vertical position it is grasped by cant hooks and twisted back and forth, causing it to sink, like the ordinary motion used in boring a hole in wood with a brad awl. When once set, the pole is either held securely by braces or guys, or it may be made firm by driving a wood curb around it, excavating the mud between the curb and the base of the pole and filling the space with concrete.

In sandy soils, particularly in New Jersey, poles are set on the principle of the jet pile, wherever there is a supply of water. A half-inch pipe about six feet in length is temporarily attached to the side of the pole, with its lower end at the butt. The other end of the pipe is attached to a garden hose, and when the pole is up-ended the stream of water makes a quicksand into which the pole sinks until the water is shut off, and the pole is sustained by pikes until the water settles, leaving the pole securely held by the sand, which becomes water-packed around it.

In mountainous countries the ledges are an impediment to excavations for poles, and although dynamite is frequently used, yet poles are set upon rock without excavation and a large number of stones are piled around them in such quantities as to grip the poles securely, although guys are generally necessary.

A pole line is not designed merely on the basis of the stresses to which the pole is subjected in drawing the wires to the necessary tension, for in most northern climates sleet will at times form upon the wires until they become icy cylinders perhaps three inches in diameter, and the problem is not that of the mere added weight, for the force of the wind blowing against this icy sail applies a greater horizontal load, which combines with gravity and produces a resultant force in a diagonal direction, greater than either of the contributing units. An ice-laden line swayed by the wind may be successfully resisted by the poles until the oscillations of the pendulum reach a synchronism with that of the vibration of some pole on the line which responds in like manner to the cumulative impact across the direction of the line, when it breaks this individual pole. Then adjacent poles are relieved of the pull on one side, and the excessive unbalanced stress breaks them.

Such is the story of a wrecked aerial line, broken by stresses not included in the ordinary course of events, and which must be provided for by large factors of safety.

It is, indeed, fortunate that meteorological conditions furnishing in sequence rain at just above a freezing temperature, and meeting a colder stratum, without wind, near to the earth, but followed by a gale, are rare and generally limited to a small area, for they present conditions which cannot be fully circumvented. Officers of the weather bureau reported in connection with a sleet storm of unusual severity, that there had not been similar conditions in that locality for twenty-three years.

The breakages of lines resulting from a severe storm in southern New England, a few years ago, revealed the fact that the damage was confined to the valleys of the rivers emptying into Long Island Sound, while the storm did not appear to be of sufficient severity to cause any damage to the lines on higher land. It is claimed that sleet never forms to a destructive extent on wires in certain portions of the northerly part of the United States, and this may be one of the instances of the rarity of such occurrences.

A pole is not to be compared to a mast upon a vessel, for these extreme conditions of severe exposure to telephone lines occur in winter, when the ground is frozen, and hold the base of the pole rigidly, while a vessel in a gale heels when struck by puffs, the sails "spill the wind," and in this manner the masts sustain exposure to winds which would break them if held rigidly to long continued impact. The most undesirable occurrences in connection with the wreckage of aerial lines are the disturbances resulting from the contacts of different electrical systems with each other, when the various lines are so near as to collide, when one or both break.

While the currents used on the telephone system are so minute as to be without power of damage, yet the wires, in crossing those of electric lighting or power systems, may in making short circuits cause serious mishaps to the electric lighting or power plant, and in any event materially interfere with the service, while the imposition of an electric lighting or power current upon a telephone line would destroy the fine apparatus and perhaps cause other injuries, were it not for the protectors used for the purpose of preventing these foreign currents from reaching the subscribers' installations, or the telephone central stations.

It is far better to prevent the occurrence of harmful conditions than it is to abate their injurious results, by a temporary sacrifice of the continuity of the service, for the

operation of a protector serves to open the telephone circuit and to prevent the use of the instruments for the time being, until the lines are cleared and the protectors renewed. The remedy against the liability of such crosses is the simple one stated by a judge of a United States court, in which the decree was given that the distance between the high and low potential lines should be equal to that of the highest pole, so that in the event of the falling of a pole the wires would come short of reaching the other line. In many instances congestion of electric service and narrow streets prevent any such wide separation, and it becomes necessary to take every precaution for substantial construction. It is necessary for such different lines to cross the others' routes, and in such instances provision against collision is made by the use of extra heavy construction, thoroughly bracing and guying the poles, and arranging against overhauling of the lines in case of their breakage; also guarding the wires so that those on the upper line cannot fall over the ends of the cross-arms in case of their separation from the points of support.

As high tension wires are of larger diameter and fewer in number, their poles should be higher at the crossover. The crossover span should be so short and at such height that in case of breaking next to an insulation, the remaining portion of the span wire should not be long enough to reach to the lower line. The necessary height of poles, or the impracticability of placing them in such positions as to provide for the short crossover spans, may sometimes render it infeasible to adopt this construction, and a grill of hardwood slats placed at frequent intervals across a pair of steel wires or cables between the two spans interposes a screen which prevents a broken wire on the upper span from reaching the lower span. In some instances, where there are but few wires in each line, they are attached to the same pole, and the contact is prevented by a framework carrying guard wires below the upper line. It is not, as a general principle, advisable to use a single pole crossover.

Housetops at first furnished an attractive route for aerial wires, and some of the fixtures for carrying these wires were of great size, but the framing of most buildings is ill-suited to resist the excessive stresses due to such loads, and the introduction of underground conduits has furnished suitable means for such main conductors, but it is necessary to carry branch wires over the tops of houses in order to reach patrons to whom the wires cannot be led in any other manner. In place of the old timber constructions, suitable iron pipe frameworks are now generally used.

AERIAL WIRES.

Aerial wires are so visibly in evidence, and often to an obstructive extent, that they may be cited as that portion of the system which naturally receives especial attention from the public. Before presenting instances of construction, it is worth while to submit two matters of principles of aerial lines and materials. The tension of a line suspended between a pair of horizontal supports varies with the sag, and is at a minimum when the sag amounts to seven-twentieths of the span, and the tension increases whether the sag is greater or less than this proportion.

For example, with No. 12 hard drawn copper wire, weighing 173 pounds to the mile, and being .104 inches diameter, and having a span of 130 feet, the minimum tension of three pounds would occur if the sag were forty-three feet six inches, while it would slowly augment with increase in the sag, and if nature had furnished a chasm deep enough for the experiment, it would be expected to reach its breaking tension of 550 pounds at a depth of 16,470 feet, or 3.17 miles. On the other hand, the increase in tension proceeds rapidly as the wire is drawn to approach a straight line, the breaking tension occurring at a sag of one and one-half inches.

As a comparison with this instance of the stresses in a local line, in the case of the No. 8 hard drawn copper wire .165 inch in diameter and weighing 435 pounds to the mile, as used on long-distance telephone lines, when the span is 150 feet the minimum tension occurs at a dip of fifty-two feet six inches, when it is only 8¾ pounds, and in like manner, as in the foregoing instance, its breaking stress of 1,328 pounds would be reached at the slightly less dip of 16,100 feet, or 3.04 miles, still too great to admit of confirmation by direct experiment; but if the wire were pulled until the sag was 2 2-10 inches, it would require the breaking load of 1,328 pounds.

It is desirable that the wires should be drawn tight enough to prevent them from swaying against each other, but it is important that they should not be drawn so tight that the contraction during extreme cold weather should cause the wire to break. The temperature is carefully noted when lines are being drawn, and the sag is left in accordance with the following table, based on a factor of safety of five computed for the usual lengths of span throughout a range of natural temperatures:

Natural Temperature Fahrenheit	Length of Span of Hard Drawn Copper Wire in Feet.					
	75	100	115	130	150	200
	Sag in Inches.					
—30	1	2	2½	3½	4½	8
—20	1½	2½	3	4	5	9
+10	1½	3	3½	4½	6	10½
+30	2	3	4	5½	7	12
+60	2½	4½	5½	7	9	15½
+80	3	5½	7	8½	11½	19
+100	4½	7	9	11	14	22½

When a wire is laden with sleet, the strain lengthens the wire and the increased sag diminishes the tension sometimes to an extent sufficient to save the wires, which otherwise would be broken were it not for this elongation.

HARD DRAWN COPPER WIRE.

The electrical advantages of copper over iron could not be utilized for aerial wires, because commercial copper has so little resilience that it will continually stretch under its own weight and become attenuated to an extent that it will break, until Thomas B. Doolittle produced the hard drawn copper wire, which is now in universal use on aerial lines. The treatment consists in omitting the annealing processes during the latter portion of drawing the wire, but it deviates from the usual method by attenuating the wire by smaller gradations at the latter die plates. The rate of diminishing the wire is wholly an empirical one, at first determined by long and thorough experimentation, and as the hardening occurs for the most part near to the surface, the tensile strength per square inch of section is greater with smaller than with larger wires.

For example, No. 8 wire is .165 inch in diameter and has a tensile strength of 62,100 pounds to the square inch, while No. 12 wire is .104 inch diameter and has a tensile strength of 64,600 pounds to the square inch.

In comparison with commercial copper wire, which has a tensile strength of about 32,000 pounds per square inch, the strength is nearly doubled. The modulus of elasticity is increased from 12,000,000 pounds to 19,000,000 pounds, or about sixty per cent, while the elongation before rupture is reduced from thirty-five per cent to 1¼ per cent. It will be noted that this remarkable change in the mechanical

properties of copper wire is produced entirely by manipulation and without the admixture of any alloy. Its electrical conductivity is practically the same as that of commercial wire drawn from the same ingots, the slight increase being due to the change in the molecular condition of hard copper.

Mr. Doolittle did not patent this valuable process of the manufacture of hard copper, which has extended the limit of electrical transmission of speech four times the distance available with iron wire and has been of incomparable value in other electrical service, and the award of the Edward Longstreth medal by the Franklin Institute in 1898 was an act of most suitable recognition of an invention which has been usefully applied to the service or mankind throughout the world wherever electric wires are spanned.

The relative cost of iron and copper wire is not a measure of the comparable expense of such lines in actual service, as copper does not have an oxide of high resistance, and its life has not yet been determined. The value of copper scrap from wrecked or reconstructed lines is about two cents a pound less than that of new wire, while galvanized iron line wire costs about four cents a pound, and when taken down is of no value and is generally thrown upon a dump. The rusting of iron wire at the joints adds materially to the resistance of the line.

A few years ago an iron telephone line crossing swamps near Norfolk, Virginia, was reported open after a thunderstorm, but an inspection showed that there was no break in the continuity of the wires; however, electrical tests revealed that the joints insulated the various sections of the wires from each other, the strokes of lightning have produced oxides of high resistance.

LONG SPANS.

Where lines traverse mountainous districts or water courses it is frequently necessary to build spans of great length, using either one of the special bronzes or steel wire for the purpose. The Connecticut river at Middletown is crossed by wires having a span of 1,350 feet, suspended between a steel-trussed tower 185 feet high on the east side, and a similar tower on the bluff on the west bank eighty-five feet high. From Enfield to Windsor Locks the Connecticut is spanned by a suspension bridge consisting of two steel cables one inch in diameter and 955 feet long, to which are fastened 2x3 inch joists 52 inches long, set twelve inches on centers. On this bridge are laid four cables containing 100 pairs of wires. The tower on the west bank is forty-five feet high, and the one on the west bank thirty-three feet high.

The St. Francis river, near Madison, Arkansas, is crossed by a span of 1,000 feet, with the wires supported upon steel-trussed towers 100 feet in height, as it was necessary that the wires should be clear of steamers on the river, which has a varying level of thirty feet between flood and drought.

At the Raritan canal crossing, near New Brunswick, New Jersey, a sixty-foot span is raised 112 feet above the canal to avoid the shipping.

There are numerous long spans crossing ponds and rivers not used for navigation at which it is not necessary to erect such high towers or to draw the wires up to a small dip to avoid masts. Long spans are frequently strung in cases of emergency, as when the flood of June 2, 1903, carried away the bridge crossing the Kaw river at Kansas City, Missouri, and also the wires attached to it, a span of wires 900 feet in length was immediately suspended between high spars erected on either bank. The Missouri river at this city is crossed by a span of 1,500 feet, consisting of fifty No. 8 bronze wires suspended between steel-trussed windmill towers eighty feet in height.

The Delaware river at Yardley, Pennsylvania, is crossed by an aerial span 1,300 feet in length with a dip of ten feet. In all instances it is necessary to use great care in the anchorage of these long spans, for a rigid attachment would cause the wires to become broken when swayed by the wind. In some instances it has proved sufficient to carry the wires through semi-circular grooves cut into a curved wood saddle upon each of the towers at the ends of the span, but the recurrence of breakages has been stopped in other cases only by attaching the saddles to springs, which will yield to the impact resulting from swaying wires.

The long spans constructed across the Mississippi, Hudson and Susquehanna rivers have been advantageously replaced by submarine cables.

The most spectacular work in line construction has been done among the mountain ranges of the west. Lines have been built against the faces of cliffs bordering deep canyons, where it was necessary to incline the poles so that the tops carrying the wires overhung the deep abyss, in order to avoid icicles and avalanches falling down the precipice. In building telephone lines through this mountainous country, a couple of poles are slung like panniers on the sides of two or three mules, tandem, and these sure-footed animals will carry them along the rough trails. The wire is wound in great lengths in connecting coils, which are placed on the sides of the saddles of a train of pack mules, which are thus connected on one side by wire from coil to coil, around the front of the foremost mule and thence back along the other side of the train. By removing the last pair of coils and unreeling, and thence in turn to the next coil, the pair of wires for a metallic circuit can be laid down along a route.

Mosquito Pass, near Leadville, Colorado, was crossed at an elevation of 13,130 feet by a line of poles which were set only fifteen feet apart at the most exposed places, but even this construction did not resist the storms of winter. Telephone lines were afterward maintained through this Alpine exposure by replacing the line of poles by submarine cable carried to this elevated site in continuous coils, as in the case of wire transportation over the mountain trails upon a train of mules, and laid in trenches among the rocks to avoid any disturbances from avalanches. There have been instances when it was necessary to make expeditions to these lofty altitudes in severe weather to make repairs.

The rough valleys through which the routes pass are picturesque in summer, but in winter the snow accumulates to such depths that linemen attend to their duties on snowshoes, reaching the lines on 25-foot poles as if they were wire fences. Among these mountains are ravines which can be crossed only by long spans, where the difficulties are increased by the inclination between the opposite ends of the span, which produces severe end thrusts at the points of support, which are built of three poles capped by crossbeams which must be held by the most secure guying. A few of these spans will illustrate the conditions necessary to be overcome in order to extend the telephone to these isolated mountain towns, at all times difficult of access, and during the long winter a hermitage were it not for this telephone service.

Imogene Basin, Colorado, at an elevation of 13,700 feet, is crossed by a span of 950 feet, which inclines at an angle of twenty-seven degrees. Near Telluride and the Tomboy mines, ravines are crossed by similar long spans. A surveying party, arranging for the extension of some of these lines, found the snow to be twenty feet deep in these basins in the middle of July, while avalanches had rolled down opposite sides of a valley, leaving a narrow pass bordered by snow and ice 100 feet in height.

These lines running from the valleys up to great elevations on the mountains are charged with atmospheric electricity, particularly in winter, which is discharged to earth by bridging retardation coils across the lines and by grounding the central part of the coils. The surveying party noted that these disruptive discharges of static electricity occurred about sixteen times a second, producing a continuous sound

which could be heard by one near to the wires. The mountain appeared to be enveloped in static electricity, the poles and the engineers' transit glowed with St. Elmo's fire, an irritation was felt at the head, and the hair would fly up if the hat were removed. This electric envelope did not appear to extend to the ground, as one was entirely free from any sensations when lying down, but if, while in such a position, a hand was raised to about three feet above the ground, a sharp sputtering sound of static electrical discharges would occur.

Other continuous structures are used for conveying large numbers of wires, especially bridges and the elevated railways in cities. Trees are a serious impediment to wires, and although it is at times feasible to arrange for a severe trimming, yet for the most part such excisions must be made in moderation and the lines arranged to go over or under.

At one of the electric light conventions, a speaker was asked what method was used by his company for trimming obstructive branches, and he replied: "For the most part the electrical method." While a high tension circuit carrying sufficient current will burn its way through a branch of a living tree, yet the self-interest of all electrical companies, without regard to other important considerations, impels them to exercise the utmost care in avoiding trees. Considerable damage is done to electric lines by trees felled during gales, and at St. Louis, May 27, 1896, and also at Minneapolis, August 20, 1904, tin roofs were stripped from buildings in cyclones and dropped upon telephone wires, the metal contacts connecting various telephone lines causing the confused jabber at any listening telephone unequalled since the days of Babel.

Telephone lines are patrolled by inspectors alert to observe incipient conditions of weakness, threatening decay of poles, trees growing too near the lines, possible hazards to the service from other electrical wires, and especially in cases of severe storms is the utmost vigilance necessary to take prompt measures in case of any occurrence which will prevent the subscriber, perhaps a thousand miles away, from having the conversation which he has the right to expect when he takes the telephone from the hook.

Useful as the telephone may be in affording facilities for communicating between different portions of a city, there are other methods of reaching one's townspeople—messenger, mail, or, like the leader in a child's game, "send myself,"—but there is no equivalent for the question and the answer which can be exchanged between persons hundreds of miles apart, their voices reaching each other in less time than if they were conversing across a room.

There are many thousands of miles of telephone lines without poles, for the business of lumbering and the wood-pulp industry is conducted over telephone lines traversing the forests from tree to tree through the wilds. By the use of the telephone the methods of log-driving have been changed for the better. The facility of communication between different gangs along a stream enables the logs to be conveyed without the disturbances caused by jams, which can be prevented by prompt action, and also avoids the destruction of timber, which would otherwise result from the use of dynamite to relieve these jams. Smaller and more rapid streams, hitherto unsuited for lumbering, have been utilized by the construction of dams, which husband and release the water as may be considered necessary by the men perhaps miles below, who speak through the telephone to those operating the gate at the dam.

The first telephone line of anything beyond a local line was in a wild country, for during the winter of 1878 telephones were used on the telegraph line connecting the signal service obesrvers at the station on the summit of Mount Washington, New Hampshire, to the base, while the first telephone central station with subscribers, in the present sense of the term, was opened at New Haven, Connecticut, January 28, 1878, although switchboards were used by associated groups of a few persons prior to that date.

One of the most useful applications of the telephone is in connection with the life-saving service, whose telephone lines extend along the shore, and the patrolman carries a small portable telephone which he can connect at fixtures upon the side of frequent poles, and in this manner communicate to the life-saving station for routine report and to summon help in case a vessel is in peril off the shore.

A telephone is a portion of the elaborate system of police signal in cities, while in smaller towns the simpler form of a telephone in a box serves the purpose. For the household it bestows an assurance of safety in the opportunity it gives to all of summoning the fire department or other help in case of emergency.

UNDERGROUND CONDUITS.

The number of wires necessary to supply the patronage in cities so far outnumbered the possible capacity of pole lines along the streets that it became necessary to place them underground, and this required the development of the underground conduit and the telephone cable as new arts. While fifty-five per cent of the telephone exchange wires are underground, yet the great number of wires in these conduits, in comparison with those upon poles, makes the number of miles of pole lines throughout the country seventy times the length of the streets occupied by underground conduits.

While no other ratio may give an adequate impression of the predominant use of the telephone for communication over long distances, yet in comparison with the length of steam railroad rights of way in the United States, the length of telephone pole lines exceeds that of the railway systems by over twenty-six per cent.

The early experimenters upon underground systems attempted to make them water-tight. The lack of satisfactory results caused the telephone companies to begin the development of the work on the principle of providing a conduit of substantial construction containing ducts in which the cables could be placed or withdrawn, and relying upon the conduit merely to provide a protection against injury. A conduit was built in which the ducts consisted of three-inch iron casing pipes treated by the hot coal tar process to insure against rusting, which were imbedded in a concrete of eight parts of fine roofing pebbles to only one of cement, and this has remained in good order for twenty-two years.

The manholes were made of brick, covered on the outside with coal tar, and the foundations laid on plank covered with coal tar before the bricks were laid. This construction was afterward used in New York, but there was not a sufficient supply of iron casing pipe in the market to supply the demand, and as it was necessary that the work should proceed as rapidly as possible, other materials for ducts were also used. Logs were bored from end to end and then squared parallel to this core, and sockets and plugs to fit cut at alternate ends to bring the cores securely in line. The wood was treated by the creosoting process before the logs were laid. Cement-lined sheet-iron pipe imbedded in concrete was also used in large quantities. At a later date vitrified clay conduit was introduced, and has been extensively used. Other materials and methods have been used, notably wood pulp tubes treated with indurating materials to render them impervious to water and a defense against decay.

Tunnels for underground cables have been dug through the soft limestone underlying the city of St. Paul, and one of the largest engineering works of the day is the extensive system of tunnels under the streets of Chicago, which has provision for cables, as well as the transportation of material. In rare instances short tunnels are built, as under the canal and railroad at Trenton, New Jersey.

In addition to the usual difficulties which beset all con-

structions under highways, the size of the manholes or underground chambers which afford places for splicing cables or changing their direction, as well as leading them from the conduits to centers of distribution, where the individual pairs of wires branch to the service of patrons, renders other occupants under the streets serious obstructions.

When underground conduits were first built in an eastern city, the engineer prepared sets of standard drawings, and so many were the modifications rendered necessary by other underground work that only one manhole was built in conformity to the standard design. A conduit, 260 feet long, containing thirteen ducts, at Seventeenth street and Allegheny avenue, Philadelphia, was successfully lowered twelve inches at one end and eighteen inches at the other, on account of a change in the street grade.

When large underground work, such as subways, is built in cities, the changes in conduits, as well as lines of pipes and sewers, present difficulties of which it can only be said, in the present available limits, that the changes were made. While a trench was being dug for an underground conduit in Rochester, an unexpected ledge was uncovered. There were no facilities at hand for removing it; a steam roller was hired to supply steam for the drills, and the ledge was soon blasted away.

Underground conduits have wrought a great change in the housing of the telephone central station plant, as the rigidity of an underground system requires that the distributing centers should be of equivalent permanency, and the telephone plant could not in such cases be subject to the mutations of hired property, but must own the buildings. Therefore, fireproof buildings have been constructed by telephone companies all over the country.

If the underground conduits remove conductors from vicissitudes of decay of poles, exposure to storm and hazards of foreign currents, yet the underground conduits have their share of mishaps. Breaks in water pipes or sewers disturb the foundations of these conduits, rainstorms flood them, illuminating gas percolates them, waiting to be ignited by a spark from a horse's shoe at some leak around a manhole cover, or it may be lighted by men going to work in a manhole with a lantern, looking for trouble and finding it.

The superficially attractive proposition of joint conduit systems, particularly in connection with a scheme of municipal conduits for all electric wires, has been attended by serious occurrences. Crosses among high tension conductors in cables occur from time to time, and if the wires of signaling systems were exposed in the narrow limits of a manhole they would be disabled.

In one city where an inclusive conduit was laid by the municipality, the work was fortunately in good hands, and the manholes were built very large, with the cables of various classes placed on supports upon opposite sides of the manholes, and the cables containing high tension wires were enveloped with split underground tile conduit tied together.

The attempt of a municipality to force a telephone company into an inclusive underground conduit system under circumstances which would expose its cables to hazardous conditions, gave rise to litigation in which the contentions of the company were fully sustained by the Supreme court of that state.

CABLES.

The necessity for cables was coincident with the decision that underground conduits must be constructed on the "drawing-in" and not on the "built-in" system, and at about the same time it was foreseen that aerial cables must replace the open wiring in cities wherever there were a great number of local wires, on account of their compactness, and greater resistance to storms. For electrical reasons it is necessary that open wiring must be used for long telephone lines.

The first telephone cables, both aerial and submarine, are believed to have been those used at Philadelphia in 1881, and at that time experimental constructions were being made at Providence, Brooklyn and Boston. In the latter city parallel rubber-covered wires, giving conditions of such great electrostatic capacity that a mile was the utmost limit of telephonic transmission, were tried, but when about a third of a mile was inserted in a telephone line, subscribers complained that their instruments were becoming worn out, as they could barely hear; and the induction between the parallel wires was so great as to transmit cross talk between the various circuits. The induction was stopped by placing the wires in twisted pairs, but the problem of insulation with a low static capacity required long experimentation by many persons. W. D. Sargent of Brooklyn tried paper insulation and found that the static capacity was reduced and the transmission correspondingly improved, which T. D. Lockwood found to be due to the occluded air among the loosely twisted fibrous paper, and not to the paper as an insulating material.

John A. Barrett of New York was engaged upon experimentation and manufacture of cables, and to him are due many improvements in cable design. At this time W. R. Patterson, now of Chicago, was working along independent lines, and made a form of hydraulic press for drawing on the lead cable sheath, which is still in use as the standard method of manufacture, although many changes of detail in the conductors have been introduced, with the result of improving telephonic transmission to over five times that of the first cables using twisted pairs.

The drawing in of underground cables is like the traction of locomotives, an instance of the occurrence of the unexpected. They can be drawn through devious ducts, around turns and across manholes to an extent which was not anticipated. The early cables were wound with steel wire twisted on a long pitch to carry the stress of drawing in the cable. Experiments on one drawn through an irregular conduit showed that the pull was about twenty tons, but such severe treatment is now avoided as unnecessary.

The cables are usually drawn in by man power, either direct or applied to hand winches, but of late mechanical power has been applied to this work. Automobiles also have been used, but a cheaper and more efficient means has been reached by a seven horse-power gasolene engine on a platform wagon, which also carries a winch.

In advance of a cable, the ducts must first be traversed by a wire to draw the cable, and the forerunner of this wire is either a number of wood rods hooked together and pushed along as section by section is added, and when the length to the next manhole is completed a strong wire is attached to the last rod, and as the first rod is pushed into the next manhole it is inserted in the corresponding duct on the other side of the manhole and pushed and pulled along, or if it is at the end of the cable run, the rods are pulled along and disjointed section by section.

A fine wire is sometimes drawn through a duct by a conical piece of wood with a thin leather washer filling the duct, and forced ahead by the air pressure at the rear, which is exerted through the application of an air pump at the front end of the duct at the next manhole. This piece of wood is termed the "mouse," and the name is probably responsible for the persistent story that lines are first drawn through the conduits by a fine string tied to the tail of a tame rat, who has been taught to do this work.

Cables are applied for miscellaneous other uses outside of conduits wherever the lines need protection against water, moisture or accidental violence. They are used for submarine lines at bridge draws and river crossings, where they appear to be the especial targets for fouling anchors and snarling propellers. The cable across the Mississippi at New Orleans becomes overlaid by the soft, viscous mud of the river, which is so tenacious that it is impossible to pull them up again. They are applied in tunnel work and in

mining, and have even been led to a stranded steamship. At Honolulu there are special facilities for laying temporary cables to vessels anchored in the harbor, furnishing them with telephone service when in port.

In all United States seaports, vessels moored to wharves can promptly obtain temporary telephone service, for which wires already are placed upon the wharves ready to be extended to telephones to be installed in the cabin. The subscribers are reached from underground cables by leading the cables through a pipe from the manhole, thence turning upward at the side of a pole, near the top of which the cables terminate in a cable box and the wires are separated into their several pairs, distributing to their respective instruments, generally by twisted pairs hung upon poles in rear alleys or attached close to buildings to avoid articles falling from windows or ice from roof cornices.

An entire underground system by which these laterals enter a basement, and thence by inside conductors extend through a building or perhaps an entire block, is rare, except in the congested portion of large cities, where the number of patrons is sufficient to require the wires of a cable, and even then it is not always feasible to obtain permission from the several owners to make holes through division walls or to place in a building other wires than those used for the service of the occupants.

The modern office buildings are provided with channels in the walls for telephone wires, and also parallel grooves under the floors in multiples of three feet from the front side of rooms, so that wires can be run from the wire entrance of the building up through the floors to positions convenient to reach desk telephones, for as the telephone connections are made in less time than any other service, such as passenger elevators in buildings, or attended by salespeople in stores, so it takes too much time for the average business man to step to the telephone many times a day, and the electrical mountain must go to the commercial Mahomet, by placing the telephone on his desk.

These laterals and distributing pipes conveying the cables branching from the main system are sources of trouble in cold climates, for water penetrates them, usually by backing up from a flooded manhole, and by freezing in the space between the pipe and the cables crushes them until the insulation becomes impaired. The former course required the expensive method of using a portable steam boiler, generally a city fire engine, to blow in steam from twelve to thirty-six hours to melt the ice, and then cut out the cable, which must be replaced by another one. One telephone company equipped a wagon with step-down transformers and conductors, which could be attached to the electric light wires and furnish a current of 700 amperes at a low voltage. The secondary wires from this wagon were attached by long clamps to the cable sheath at the distributing pole and at the manhole, furnishing a current sufficient to heat the cable, and in a few minutes the melted ice ran into the manhole.

In some places, where there are not any electric lighting wires within reasonable distance, an automobile boiler is used to give a supply of steam, at far less cost than a steam fire engine, for which the hire is $5 an hour.

The cable is not disturbed, as it has been found that, although the ice pressure may have collapsed the cable to an extent sufficient to short-circuit the conductors, yet the elasticity of the paper insulation is such that in a short time the insulation will be restored.

The damage by freezing does not take place in the horizontal pottery laterals of three-inch sewer pipe leading from the manholes, but occurs in the iron pipe which comes down the side of the distributing pole and connects to this pottery pipe by an elbow of three feet radius and a straight run of twelve feet to the sewer pipe. It is proposed in the future to use sewer pipe runs and elbows.

Although lead-covered underground cables entering buildings or kept in storage are frequently gnawed by rats, which receive a swift retribution in case of cables containing high-tension circuits, yet aerial cables have of late been attacked by insects which cut through the lead sheaths with their sharp mandibles for the purpose of laying eggs in the interior. In China and Japan such perforations occur near the bamboo thickets, where an insect which lays its eggs in the bamboo stalks abounds. This difficulty is overcome by wrapping such cables with burlap soaked in linseed oil.

In Australia similar difficulties have occurred over a wide expanse of territory, where it has been found that four species of beetles have in this manner perforated lead cable sheaths. In Texas perforations are quite frequent, but it has not been found what insect produces these holes.

LARGE INDEPENDENT CONSOLIDATIONS.

Details are given by the newsapers of the middle west as to deals and sales in relation to a number of Independent telephone plants, the moving parties in the transactions being the Barber & Brailey syndicate, which centers chiefly at Toledo, Ohio. Several weeks ago T. H. Ferris and C. H. Poole, representing a syndicate of Rochester and Utica capitalists, went to Toledo and purchased Barber & Brailey's interest in the Herkimer (N. Y.) Independent Telephone Company. The promoters in question said that their syndicate had organized a holdings company with a paid-up capital of $5,000,000 and represented a controlling interest in a number of Independent telephone companies in central New York, including the Utica and Herkimer companies. This holdings company also controls a number of important toll lines, including the one running from Utica to Rochester.

A similar deal is pending for the consolidation of a number of Independent telephone companies outside of Toledo, but in Ohio, and including among others the Springfield & Xenia plant. This latter property has made a good record for the year. The bonds which were but recently sold at from 65 to 68 are quoted in Cleveland at 90 for the bonds and 15 for the stock.

SAVING SOULS BY TELEPHONE.

In the work of saving souls two religious campaigners in Kansas City are using the telephone. Often the meditations of a housewife, a business man or a student are now interrupted by the ting-a-ling of a telephone bell. A few seconds later the interrupted one hears something like this:

"Hello! Probably you have heard that the churches of Kansas City are conducting a revival and we want you to come."

This was the result of a happy inspiration on the part of the ministers and church members to bring out the people who do not usually go to church. A woman who interested herself in the campaign from the start is said to have conceived the idea of making the telephone the means of stirring up the non-church-going men and women.

"These are the people we must reach to be successful in this campaign," said one of the evangelists. "The preliminary meetings have been attended largely by church members. That is all right. We want them interested in the revival. But it is those outside the church we want to see in the audiences we talk to at these meetings. The problem was how to reach them effectively and quickly. The telephone system was the answer. Our personal workers have church members making lists of telephone numbers of people in their neighborhoods who ought to be attending these meetings. They get busy calling them up when the lists have been made. It gives them an active part in the campaign and results in much good to the movement."

CONSTRUCTION OF STATUTES—REGULATION AND USE OF STREETS.

IN THE disposition by the Supreme court of Kansas of the suit by the city of Wichita to oust the Missouri & Kansas Telephone Company from the streets of that city, several questions of importance were discussed which we here note. By way of review, it should be said that this suit is but one of the long and expensive legal entanglements between the above corporations, brought originally by the former to drive the telephone company from the city. An injunction was sought to bring about this result. It was denied in the district court and has been again by the higher tribunal. The facts were as follows: Plaintiff denied the company the use of the streets unless it should secure a franchise from the municipality. It averred in addition that the statute of the state giving authority to telephone companies to incorporate was unconstitutional in that its title has more than one subject. This title reads as follows: "An act providing for the *formation* of telephone companies." The city contended that "formation" was not clear in meaning and was capable of many interpretations. The Supreme court refused to say that the act was unconstitutional, and on the other hand affirmed its constitutionality. (Sections 1251, 1252, Gen. St. 1901.) The statute conferring on telephone companies all rights given to telegraph companies (Article 8, Chapter 23, Gen. St. 1868) was also discussed and the court in approving the law said:

"Telegraph and telephone companies are both public utilities used for the transmission of intelligence between distant places. The use of poles and wires with electricity as the medium of transmission is the same in both. To change the one to the other is only to change the apparatus at the termini. Substantially the same public function is being executed in substantially the same way by corporations employing either means of communication. There is really no difference in character between telephone and telegraph companies. The same language employed to extend rights to a telegraph company, with only the change of name, may be used to confer rights upon telephone companies."

The court then cited many decisions affirming this position, among them those cited in discussing the same question in the January, 1905, issue of TELEPHONY.

Section 53, chapter 122, page 187, laws 1903, of Kansas, gives to cities of the first class the right to determine and designate the streets and alleys of the city which may be occupied and used by the posts and wires of telegraph and telephone companies, when construed with section 74 of the general telegraph act (Article 8, chapter 23, Gen. St. 1868). "To grant the right of way," found in the city charter, the court construed to mean that the city had authority to regulate the location of the companies' properties. It was also said that the general police powers of cities of the first class may be exercised by such cities over telephone and telegraph companies within their corporate limits, together with such regulations as are by statute conferred upon cities of the first class. The decision is highly favorable to the telephone company.

City of Wichita v. Missouri & Kansas Telephone Company, Supreme Court of Kansas, 78 Pacific, 886.

RIGHTS OF TELEGRAPH COMPANIES ON RAILROAD RIGHTS OF WAY.

The Supreme court of the United States has decided that telegraph companies were not granted the right of eminent domain or any right to enter upon and occupy the rights of way of railway companies without the latter's consent by the act of July 24, 1866 (U. S. Comp. Stat. 1901, p. 3579), giving telegraph companies the right to construct, maintain and operate telegraph lines through and over the public domain, and "over and along any of the military or post roads of the United States." This statute was deemed by the court but an exercise by congress of its power to withdraw from state interference, interstate commerce by telegraph. Neither in the opinion of the court are railway rights of the way made public property by charter provisions declaring the railways "public highways," so as to subject such rights of way to occupation by telegraph companies without the consent of the railways under the act of 1866, giving telegraph companies the rights before mentioned.

Western Union Telegraph Company v. Pennsylvania Railroad Company, United States Supreme Court, 25 Sup. Ct., Rep., 133.

PRIVATE CITIZEN CANNOT MAINTAIN INJUNCTION TO ANNUL FRANCHISE OF COMPANY.

George W. Clark, a taxpayer in the city of South Omaha, Nebraska, brought suit against the Interstate Telephone Company requesting an injunction to restrain the defendant from operating under its franchise granted by the above city and seeking a general order declaring the franchise void. Various irregularities were alleged by the petitioner as reasons why the franchise was illegal, among them being that the special election which was called to submit the question to the vote of the people was improperly called. The lower court sustained a demurrer to the petition filed by the company, which virtually decided that even if all that the petition alleged were true the petitioner must fail. No claim was made in the petition that any of the lines of the telephone company or poles passed over plaintiff's land, and there was, therefore, no special damage for which he could complain. The court said that if there was any right in the petitioner to maintain the action it must be found either in that the mayor and common council were without authority to grant any franchise or that the franchise so granted was a general property right partly belonging to plaintiff and that it had been "illegally dissipated" by the municipal authorities. The court found ample reason for deciding that there was authority in the above officers to grant the franchise and gave little heed to the theory that any property rights of plaintiff had been dissipated.

On the question of the proceeding by injunction to annul a franchise the court said: "It seems to be well established both on principle and by the authorities, that a private individual suing simply as a taxpayer must show something more than a mere speculative or theoretical wrong which has resulted or will result from a mere illegal act of a city council, to entitle him to equitable relief. It is not enough that the act alleged against is simply illegal, but it must also appear that the illegal act will result in the evasion or destruction of a distinctive right belonging to the party maintaining the action, or to the body of citizens for whom

he sues. Injunction by a taxpayer is not the proper remedy to test the usurpation of a franchise by a corporation." In Linden Land Company v. Milwaukee Electric Railway Company (Wis.), 83 N. W., 851, it was held that "a taxpayer of a city cannot maintain a suit to prevent the city from granting a franchise to a street railway unless the franchise constitutes such a wrongful squandering or surrendering of the money or property of the city that taxation will be increased thereby." The Supreme court, in affirming the opinion of the lower court, said further that if all that the plaintiff contended for were true a suit by a private citizen to restrain the exercise of the franchise in question could not prevail.

Clark v. Interstate Telephone Company, Supreme Court of Nebraska, 101 N. W., 977.

STRIKE OF EMPLOYES WILL NOT EXCUSE A COMPANY PERMITTING WIRE TO REMAIN IN DANGEROUS PLACE.

The Court of Appeals of St. Louis, Missouri, has said in a street railroad case heard by it in which negligence was charged against the transit company in permitting a wire to remain down during a strike of employes of the company that "the prevalence of the general strike, suspending operations . . . so far from excusing or justifying the perilous condition of the wire, rather aggravated it, and lent force to the charge of negligence in permitting the electric power to be conducted through the wire at a period when, from the suspension of the system, and the continued cessation . . . such motive power was not required to be in use." Negligence cannot be excused by showing the existence of some other condition indirectly explaining the negligence, when, as a matter of fact, negligence exists. The force of this decision is apparent.

Cleary v. St. Louis Transit Company, 83 S. W., 1029.

INJURY TO TELEPHONE LINEMAN.

In a recent case in Iowa, the Iowa Telephone Company was defendant in a suit brought by one Barto, a lineman in its employ. The company had allowed an electric light company to string wires on the telephone poles and in some way some of these electric wires came in contact with a telephone wire with which the plaintiff was working. The live electric wire shocked plaintiff severely, caused him to fall and resulting injuries were sustained. The important points are well given in the syllabus which are as follows:

"1. A telephone company which allows an electric light company to string wires on its poles must use reasonable precautions to see that the electric light wires do not expose its employes to unusual peril." Barto was not an experienced inspector and knew little about the tests to use to determine whether wires were charged, and in fact this duty did not rest upon him in the employment in which he was engaged. He had no apparatus with which to test live wires. Under these facts plaintiff did not assume the extra danger caused by the presence of the electric wires.

"2. Persons using and maintaining electric apparatus must use a degree of care and skill commensurate with the danger involved."

The live wire which caused the injury was hanging loose and downward and it was shown that it had been in that condition for over a year. The court held that this fact was sufficient reason to assume that the telephone company should have known of the circumstance and that a liability from this unusual danger to a lineman existed. This was for the jury as a question of fact. It was contended that all dangers of the kind to which Barto was subjected were assumed as incident to the employment, but the court held otherwise.

Barto v. Iowa Telephone Company, Supreme Court of Iowa, 101 N. W., 876.

AN INTERPLANETARY TELEPHONE.

The actual achievements of electricity in the modern period have been so marvelous, so outrunning the wildest dreams which the imagination could have pictured for them, that, no matter what those magicians say they can do, the world, not allowing itself to be affronted with any approach of extravagance, is bound to stand still and listen. Nikola Tesla has such a list of electrical achievements to his credit that when he tells us he is going to wake up Mars one of these days, and possibly some other plants, with an oscillator of ten million horse power which he is getting up—a sort of an interplanetary telephone—we are obliged to take the statement into more or less serious consideration.

The instrument, according to his declaration, presents no unusual difficulty. He says he can make one representing a much higher power, say, that of a thousand million horses, and with this some foundation is given for the belief that he can do with the world and the whole planetary system pretty much what he likes.

Such a scheme fatigues the lay imagination, exhausted with previous surprises of all kinds which the inventing electricians have prepared for it, and it is not easy to say in the first shock of wonder attending the declaration what the world and its societies, near and far, all very much interested in the matter, ought to do about it.

Confiding such a large force to the will and discretion of an individual, or even of a consolidated stock organization, looks rather perilous. It seems as if the stability not only of the cloud-capped towers, the gorgeous palaces, and the solemn temples, but of the great globe itself, with even some of its outlying siderial sisterhood, would in such case stand in much peril.

Such a force as Tesla names outruns the wildest reach of mundane conceptions. The idea presents to the mind a sublime image of disturbing forces in action; shows how their potencies lie bosomed in the stillness and calm of the universe; but there is nothing especially attractive about it, and it promises, so far as the average conception goes, no practical usefulness.

The fancy of conversing with suppositious inhabitants of our next-door planetary neighbor has taken a strong hold on the minds of electricians, astronomers and others in recent times, but when we come to think about it, what possible good could flow from opening communications with that lurid star, shedding its trails of fire and dews of blood and carrying around in its revolutions a population with which and whom we might not like to have anything to do? On the other hand, Mars will no doubt go on in its old courses, not heeding any of our signals, and in no increased degree "subject to the constitution of the United States," whether Tesla turns his batteries on it or not.

BLIZZARD BENEFITS "HELLO GIRLS."

On account of the recent severe blizzard in New York City the telephone girls were not permitted to go home at night, the managers of the exchanges fearing that the storm would be so severe the next morning that they could not get back. Many of them were compelled to work overtime, the calls being very numerous on account of the great number of suburbanites who were unable to get trains for their homes. For this work the girls received double pay, and in addition will get a full day off with full pay. They were taken to hotels, chaperoned by the matrons, were given the best rooms and permitted to order whatever they wanted to eat. One hotel sheltered no less than 150 girls. They had a great time, the fact that they didn't have their "robes de nuit" with them being the only annoying feature.

Eliminating Isolation from Farm Life

FRED DE LAND.

THE remarkable discoveries explorers have uncovered in the ruins of buried Egyptian, Persian, Babylonian and Assyrian cities prove the existence of an advanced civilization more than ten thousand years ago, a civilization whose memorials extend back to an unknown prehistoric age. And the further back these discoveries go the more mature appears each phase of this ancient civilization, until it seems reasonable to believe that thrice ten thousand years may have elapsed during its upbuilding.

Yet no matter how far back we go, the one fact that stands out most prominently is that the tiller of the soil has been the pioneer of all civilization. For among the many treasures brought to light in these long hidden cities, were paintings and engravings representing farmers at work in fields of grain, using sickles somewhat similar in form to those now used, and having near at hand the familiar jug with its refreshing beverage. Records were also found testifying to enormous crops of corn grown in the rich alluvial soils. Thus it is natural to expect that the tools and the skill employed, and the character and the quality of the product—the cereals, the fruit, the vegetables—appertaining to so old an industry, should be further developed than the methods and the output in any other occupation. And this is mainly true. Yet how few agricultural improvements antedate the eighteenth century of the Christian era. In other words, seven generations of farmers have witnessed the displacement of obsolete methods, crude mechanism and primitive tools that may have served seven hundred generations.

Two modern inventions that materially modify and enrich the industrial and the social conditions of the farmer are the reaper and the telephone. A practical reaper was invented seventy-four years ago and its inventor was declared to have "done more for the cause of agriculture than any other living man." The electric-speaking telephone was invented twenty-nine years ago, and in less time than the allotted life of a generation has eliminated or modified many of the customs that formerly prevailed in social, industrial and professional life.

There were crude reapers two thousand years ago. But the most careful searching through all records that have come down through all the ages fails to reveal either the existence of any kind or form of an electric-speaking telephone prior to the nineteenth century, or definite knowledge concerning the induced currents—the basic principle underlying the action of the telephone, and without which it would be only the toy long known as the "lovers' telegraph."

The "induced currents" were discovered by Faraday in the same year that the modern reaper was invented, 1831, and, strange as the statement reads, only one of the three generations that watched the development of the modern reaper has comprehended even a few of the revolutionizing industrial possibilities inherent in the induced currents. More than a billion dollars are now invested in the telephone industry, and many billions are invested in industrial electricity. Yet more than three-fourths of all these enormous investments have been made during the last thirty years, that is, were made in the lifetime of one generation. For vast as the electrical industry is, and complex and far-reaching as is the modifying and the revolutionizing influence it exerts on all other industrial occupations, it virtually came into existence only in the opening year of the nineteenth century of the present era, and only began to be actively developed thirty years ago.

Yet what is so marvelous, so varied, so familiar or common, and yet so unknown, as the manifold applications of electricity? And how few recall that the commercial dynamo-electric machine is not forty years old; that the induced currents were explained only seventy years ago; that electro-magnets are only eighty years old; that the voltaic battery was unknown a hundred and ten years ago; that there was no science of electricity and magnetism so late as Franklin's day, and that even so sensible and far-seeing a statesman as Franklin could not "find any useful application of electricity." Nor did he perceive that if lightning and electricity were one and the same, that an agent of such enormous potentiality might be led into useful channels and its energy utilized in ways that would not only enrich the nation and add to the health and comfort of its people, but would aid in releasing mankind from much of the enslavement inherent in certain kinds of manual labor.

Those who came after Franklin have, in a sense, harnessed and are able to partially control that which partakes of the same nature as the lightning Franklin drew from the clouds; and they can give a reasonable explanation of its relation to other forms of natural energy, as light and heat. Yet all that is known only makes clearer the depth of the unknown. To-day the rapid progress in the practical applications of electricity is the marvel of the world. Yet fifty years ago, it was recorded that "Electricity is the poetry of science; no romance, no tales of fiction excel in wonder its history and achievements." And at that time the telephone and the trolley, the arc light and the incandescent lamp were unknown!

The electric-speaking telephone was the outcome or result of a sensible longing on the part of a big, wholesome lover to devise some means by which his sweetheart could hear or read the tones of his voice as well as read speech from his lips. He endeavored to devise a method based on Koenig's experiments, of optically exhibiting the distinctive curves of sound, or the characteristic varying vibrations of the air that occur when words are spoken. And while he succeeded in disassociating and reflecting in a mirror the elemental forms of sound waves, these reflections proved too evanescent in ordinary conversations, vanishing too rapidly to be easily read. Then, following Scott's method, he attached a straw stylus to the parchment disc of a modified form of phonautograph, and caused it to trace upon smoked glass the vibratory movements of the diaphragm.

Being a student of anatomy and familiar with the mechanism and the functions of the human ear, the impression that came to the lover was the marked similarity between the movements of the stylus when actuated by the vibrating diaphragm, and those of the small bones of the ear when the drum is caused to vibrate. And he wondered whether an instrument modeled upon the mechanism of the ear would prove more serviceable. So, with this thought in mind, he consulted an eminent aurist, who suggested the use of the human ear itself as a phonautograph, and prepared an excellent specimen which the surgeon and the lover used in further study of the ear and the manner in which articulate sounds are reproduced in that organ. It was observed that when the tones of the voice entered the tube of the ear, the sound waves caused the drumhead to vibrate in unison with each undulation and each modulation of the vocal tones, and that these vibrations were exactly reproduced by

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the chain of three small movable bones called the ossicles of hearing. Then a fiber of wheat straw was glued to the inner bone, the stapes, and a plate of smoked glass arranged to mechanically move just beneath the straw, and on the sooty surface of the glass appeared perfect curves exquisitely traced of each and every sound-wave that entered the ear. No matter whether the lover spoke harshly or gently, rapidly or slowly, sang or whistled, each sound, each individual tone and each tone color produced its own distinctive curve.

While this experiment was a success in affording a permanent record, it was not a serviceable method for general use. And though a failure in that sense, the experiment proved to be of inestimable benefit. For in observing how sensitive the drumhead was to every change in the vocal tones, and how instant was the sympathetic response of the bones of the ear to each sound-wave impinging on the drumhead, the thought came to the lover that if that delicate little membrane known as the tympanum of the ear, and thin as tissue paper, could control the vibrations of bones comparatively immense in size and weight, why should not a larger and a thicker membrane be able to vibrate a piece of iron in front of an electro-magnet?

The lover was not the first who wanted to—or tried to—transmit speech with the aid of electricity, nor was he the first to use a parchment or a metal diaphragm; and he knew that during several hundred years speech had been transmitted from one room to another, or from one house to another, by means of a toy known as the "lovers' telegraph," a device consisting of two short tubes, each having an end covered with parchment or thin skin, and connected together with a tightly-stretched string passing in a straight direction through the center of the parchment or membraneous diaphragm. So the question he propounded to himself was: Can I replace the string with something else that will serve not only to connect the two diaphragms at any angle and with many changes in direction, but will cause one diaphragm to exactly reproduce the vibrations of the other as well or better than the string does? He perceived that it was a complex problem and that it must be considered vocally, mechanically, magnetically and electrically; and for a time, the more he worked on the problem, the more numerous grew the complicating factors that were ever-changing in character or in permanence. But after many months of patient and expensive experimenting, and including many dicouraging failures, he successfully solved the problem in its every phase, and embodied in his claim for a patent so complete a description of his conception of the invention that the intervening years have yielded no simpler nor better form of expression.

What the world gained in the successful solution of that problem, was a method by which an electric current practically takes the place of the string in the "lovers' telegraph," a method which conveys messages up hill and down dale, around many corners and across wide rivers. And not only did the method make it possible to replace the string with an electric current, but with a beam of light, and even with so tangible a substance as the ether waves.

What Alexander Graham Bell did do was to replace the tin cans or tubes of the "lovers' telegraph" with a simple, perfectly proportioned instrument of exquisite sensitiveness, that acts as an alternating-current generator when used as a transmitter, yet is transformed into a perfectly governed alternating-current motor when used as a receiver; an instrument so simple in its operation that the only energy necessary to transform the sound waves into sufficient electrical energy to overcome the resistance of the circuit, convey the spoken words in the form of electrical undulations to the receiver, and there re-transform them into sound waves, is the energy expended by the vocal cords of the speaker; an instrument of such extreme sensitiveness that it detects the presence not only of feeble direct currents that no other form of instrument would record, but of minute rapidly alternating currents; an instrument that enabled the physicists to demonstrate and to turn to practical utility what had been mere laboratory beliefs; an instrument without which the modern microphone would never have been devised; for all of the brilliant researches of Professor Hughes were made possible "owing to the discovery of Professor Bell's wonderfully sensitive telephone"; an instrument so simple in construction that even electricians scoffed at the idea that sound could be conveyed in such manner, pronouncing the claimed transmission of the spoken word a trick prearranged to deceive the gullible; an instrument so crude in mechanical design that financiers, while admitting the bare theoretical possibility that sound might be conveyed for short distances, could perceive no way in which the theory could be transmuted into profitable commercial practice; an instrument rejected by the builders of other industrial enterprises, yet now forming the corner-stone, the heart, the one vital principle, of the whole system of telephony, and without which all the myriad accessories would be unknown or unused.

Alexander Graham Bell's invention was exhibited at the Centennial and there won high praise, his wonderful achievement being heralded "as a result of transcendent scientific interest" and one that "appears to surpass all other modern discoveries, great as they are." The official report of the jurors told how "the result is produced with striking effect without the employment of an electrical current other than that produced by the mechanical action of the impulse of the breath as it issues from the lungs in producing articulate sounds. Audible speech has, in this way, been transmitted a distance of three hundred miles."

But a year prior to the Centennial, Bell had operated his primitive telephone "made by a Brantford, Ontario, artisan," on a farmers' line nearly five miles long. A telegraph wire four miles long formed part of the circuit. Dr. Bell states that "as no additional telegraph wire was available, and we could find nothing in the hardware stores but stove-pipe wire, we had to use stove-pipe wire to complete the line." Dr. Bell further states that "we did not trouble to put up poles, but tacked the wire to the fence. In this way the first message was sent over the telephone."

That was the first of all telephone lines. It was not only the first telephone line, but the first farmers' line and the first fence line. It was built thirty years ago this coming summer, and the crude telephone instruments used on that line were the forerunners of the 400,000 farm telephones now in use.

To repeat all the eulogies and tell of all the honors conferred upon Alexander Graham Bell by scientific bodies and educational institutions, by reason of his invention of the electric-speaking telephone, would require many times the space generously allotted to this paper. To tell of the immeasurable benefits that the deaf are deriving from the intelligent systematic efforts he has put forth for their advancement, is more timely and should prove more interesting. For he has given the subject of the education and the welfare of the deaf more study than any other living man, and the magnificent results of his unselfish labors will be manifested in ever-increasing magnitude as the generations come and go. Strange as the statement may appear, marvelous as the invention of the telephone is, invaluable as are the benefits that industry, commerce and society derive from its use, practically it is the lesser of the contributions to the welfare of humanity so generously made by Alexander Graham Bell.

The numerous channels through which telephone service proves of definite value to the farmer are so obvious and have been explained in detail so often and in so many ways, that the wonder is that these well-known functions are not familiar facts in every farm house. For not only does telephone service eliminate the isolation and the loneliness inherent to many farming communities, but it introduces that which is of greater value, the factor of safety to life and to

property, of preservation of crops and of protection to live stock.

In sudden illness or painful accidents, the physician, the nurse and helpful friends are within speaking distance; and in lingering illness telephone service may enable the physician to diagnose changes in the invalid's condition in time to avert much suffering or serious relapse. Telephone service insures a sense of safety to property because the horse thief is unknown and the tramp with his petty thieving and his dangerous barn-destroying pipe has become a minus quantity in communities where the telephone affords rapid intercommunication between farm houses. Indeed, the terminology of the hobo's profession is now said to include words or phrases that indicate localities to be shunned because of the intercommunicating facilities afforded by the local telephone service, while other sections are to be favored not only because the residents prefer the isolation and loneliness indicative of an absence of up-to-date methods, but because there is far better chance of escaping with the stolen goods.

Telephone service makes possible the prompt delivery of weather indications, thus affording ample time in which the farmer may take the step necessary to dispose of or protect the crops, or to house the live stock, or to move all perishable property out of the probable path of a flood. Telephone service affords constant communication with the local and the metropolitan market, and quick access not only to one but to many buyers whenever the market has an upward tendency. It saves the loss incident to long hauls when the market is falling rapidly, and has materially modified the necessity of the middleman. For the telephone brings buyer and seller face to face, irrespective of intervening distance, and the trader truthfully tells the market price, knowing that the seller has only to knock at the telephone door of the competing merchant in the adjoining store to learn the facts.

Ordinary distances are of small moment in sections where the telephone is freely used. For telephone service enables the farmer to live in a more desirable, more productive section, even though it be more distant from the town where he markets the products of garden and farm. As it enables the farmer's wife to order the groceries that are delivered through the courtesy of some farmer passing the house, so it permits the grocer to tell the farmer or the fruit grower what fruits and berries to deliver on the morrow, or the number of eggs to send in by the first team passing cityward.

A telephone in the house has enabled the farmer's children quarantined by illness to recite their daily lessons to the school teacher and thus maintain their standing in their respective classes, though debarred from the school room; it has softened the dreariness of the invalid's life by enabling chatty visits to be made while propped up with pillows. Telephone service enables morning gossiping to be indulged in before the dishes are washed; afternoon visits to be paid without the necessity of dressing up or of driving on a dusty road in the hot glare of the summer's sun, or in the biting winds of a wintry day; evening visits to be returned while reclining in one's own comfortable rocking chair.

Telephone service increases the earning value of many farms, through helping to lessen the cost of operating and maintaining the farm property. For the intelligent use of telephone service has made it possible to dispense with the services of an extra man, and thus effect a net saving of from $300 to $600 a year.

There are cheap plows and good plows, flimsy hoes and strong hoes. In the long run the best are the cheapest. But the best of plows and hoes and spades will not make a farm productive without the owner has some knowledge and some experience concerning the component elements of the soil, the character of the climate, the total precipitation, and many other points. If one farmer gets better service over a cheaply-constructed grounded-wire telephone line than his neighbor obtains through possessing a heavily-constructed standard pole line carrying metallic circuits, the reason is easily found. The first farmer has absorbed knowledge concerning the many little things that make satisfactory telephone service, just as he understands the nature of the soil he is cultivating, of the soluble minerals and organic substances which serve to supply vitality to plant life; and plans judicious rotation of crops. His neighbor has a better yet a barren farm, just as he has a better yet a useless telephone line. The soil is not utterly exhausted, not altogether barren; it lacks only the essential mineral salt, or the one local condition requisite for productivity. So the tightening of a joint, the loosening of a screw, the replacement of a broken cord may convert the useless into an excellent telephone line.

When the kingbolt falls out, and the farmer follows suit, cause and effect are self-evident, and the blacksmith is not required to travel miles in search of the cause. When father places his steel-rimmed spectacles across the binding-posts on top of the telephone, or mother drops her sewing on the floor and on top of the telephone places the scissors she was holding in her hand when the telephone bell rang, the effect is immediately evident, though the telephone man may spend an hour in locating the short-circuit.

Just as any kind of an old telephone line will answer in some localities, so some farmers find it only necessary to scatter seed on the ground to have the crop grow up as Topsy grew. But other farmers crave more than a mere Topsy. So a telephone line that is out of service now and then may cause as much suffering or loss to the farmer dependent on prompt communicating facilities, as to the captain of industry. To plow deep, to use a subsoiler, to cover the surface of the soil with enriching or moisture-restraining substances, is absolutely essential to productivity in localities unknown to Topsy-like methods, and where high winds prevail three hundred and sixty-five days in a year.

Twenty sticks per mile may be sufficient for the Topsy line. But the same high winds that carry off the moisture render thirty or forty heavy poles per mile necessary in a telephone line from which service must be secured three hundred and sixty-five days in the year.

In the past the cities may have absorbed the country. Nowadays the country is absorbing the city. One-half the population of the Empire State may reside in New York city, and Chicago may contain forty per cent of the population of Illinois. Nevertheless, of the total population of the country, the homes, the abiding places of more than two-thirds, are out in the country, either on farms or in the small villages.

And if the present migratory trend continues, the coming generation may find three-fourths of their number living in the country or suburban homes, not because the atmosphere is more helpful, physically or morally, but because of that innate desire to get breathing-room, because of the growing congestion, and because the telephone has eliminated distance in the transaction of most of the important affairs of life.

This ever-increasing congestion in the larger cities is the impelling cause that is sending to the country, or to the country village, all whose circumstances permit of migration; a congestion that neutralizes the excellent advantages and the many conveniences that city life affords.

It is of record that there is an average of 16,000 people in each square mile in the city of Baltimore; 15,000 in Jersey City; 13,000 in Boston; 12,000 in Milwaukee and 10,000 in the city of Philadelphia; while the entire county of New York, including the city, contains an average of 22,000; in Kings county, including Brooklyn, there are 15,000; in Suffolk county, including Boston, 12,000; and in Philadelphia

county, including the city, there is an average of 10,000 people in each square mile of area.

It is the telephone that enables the busy man of affairs to reside far from the roar and turmoil of the metropolis, yet to keep constantly in touch with whatever may affect his income from the time of arrival at his country home until his departure for mill or factory or office. And if the residence sections of the larger cities are to be occupied by subordinate toilers, is it not reasonable to suppose that one of the beneficial results that will follow this migratory movement, is a marked increase in the market value of farm properties in desirable locations?

Telephone service is of value to the farmer in so many other ways that the wonder is not that 400,000 farms now rely upon this modern public-service function, as completely as on the hoe and the spade, but that any farmer would dream of farming or of housekeeping without a telephone and good telephone service.

AN AUTOMATIC DECISION.

In an appeal from the examiners-in-chief of the United States patent office in the case of Faller vs. Lorimer and Lorimer, F. L. Allen, commissioner, handed down the following decision on December 12, 1904. TELEPHONY understands that the Faller Company made no appeal within the required forty days after the decision was rendered:

This is an appeal by Faller from the decision of the examiners-in-chief affirming the decision of the examiner of interferences awarding priority of invention to Lorimer & Lorimer upon the following issue:

"1. In an automatic telephone exchange, the combination with a number of subscribers' lines leading into said exchange, of switching apparatus located at said exchange, and electro-magnetic means for initially controlling the said switching apparatus, and means for rendering the said initial controlling means operative by the subscribers non-simultaneously, and in fixed order of rotation.

"2. In an automatic telephone exchange, the combination with a series of subscribers' lines leading into said exchange, of switching apparatus, electro-magnetic means for initially controlling the operation of said switching apparatus, and means for forming temporary electrical connection between said initial controlling means and one of said lines at a time.

"3. In an automatic telephone exchange the combination with a series of subscribers' lines leading into said exchange, of switching apparatus located at said exchange, electro-magnetic means for initially controlling the operation of said switching apparatus and a progressive contact maker placing the said controlling means in operative connection with said lines successively and with one at a time.

"4. In an automatic telephone exchange the combination with a series of subscribers' lines leading into said exchange, of switching apparatus located at said exchange, an electro-magnet for initially controlling the said switching apparatus and a progressive contact device placing said controlling magnet in connection with said lines successively and with one at a time.

"5. A telephone system having a central exchange and subscribers' stations, automatically operated switching mechanism located at said exchange, a circuit normally broken at the subscriber's station and at the central exchange, a progressive contact maker closing the break in said circuit at the central exchange at periodically recurring intervals, and means at the subscriber's station for closing the break at the subscriber's station, said switching mechanism being made operative upon the establishment of said circuit.

"6. In an automatic telephone system the combination with subscribers' stations and an exchange, of lines from said subscribers' stations to said exchange, a common return between the said subscriber's station and said exchange, the said common return being nominally disconnected from the subscribers' lines both at the subscribers' stations and at the said exchange a progressive contact maker connecting the said common return to the subscribers' lines one at a time periodically and in rotation, means at the subscribers' stations for connecting the said subscriber's line to the common return, and automatic switching mechanism at the said exchange, the said mechanism being rendered operative upon the establishment of any one of the circuits including the said common return."

The dates alleged by the parties in their preliminary statements are as follows:

	Faller.	Lorimer & Lorimer.
Conception	Spring of 1896	March 16, 1897
Drawing	Spring of 1896	August 16, 1897
Disclosure	Spring of 1896	March 16, 1897
Model		
Reduction to practice	May 22, 1901	December, 1897

The invention covered by the above counts is an improvement in devices for automatically connecting the line of the calling subscriber with the line of the called subscriber. Machines of this character are extremely intricate, as evidenced by the drawings and specifications of the parties involved.

With the filing of his appeal Faller assigned no less than eighteen errors in the decision of the examiners-in-chief. He was, however, not present at the hearing nor was he represented by counsel. Neither has he filed a brief in support of these numerous reasons of appeal.

Both the lower tribunals have gone carefully into the voluminous record. No useful result would be accomplished by merely reiterating all their conclusions of fact which are abundantly established by the evidence. There are, however, certain features of the record which should be mentioned.

Faller in support of his alleged conception and disclosure in 1896 testifies that at this date he invented an automatic gas cut out. It is apparent that whatever was the construction of this gas cut out it was in an art foreign to an automatic telephone exchange and cannot establish a conception of the invention covered by the counts of this interference. It furthermore appears that this early construction contained merely the progressive contact maker, which is only one of the several elements covered by the issue. As to the contention about the scope to be given the element "switching apparatus" or "automatic switching apparatus," when considered in connection with the disclosure of Faller's patent, from which the counts in this interference have been copied, it must be held to be devices adapted to connect one line with another of a series automatically and not a mere make and break device.

The evidence of disclosure by Faller of the invention in issue prior to Lorimer & Lorimer's record date, April 24, 1900, is merely oral and is far from convincing. This evidence merely tends to show that Faller had a conception of the advantages to be derived by using a progressive contact maker as an element in an automatic telephone exchange, but it does not establish that he had a conception of the manner in which it would be necessary to combine the progressive contact maker with a switching apparatus for an automatic telephone exchange. In this lies the invention covered by the counts of this interference. The evidence fails to show that he had a conception of the means whereby this progressive contact maker could be operatively connected with the switching apparatus. He therefore has failed to establish a conception of the invention set forth in the issue prior to the record date of Lorimer & Lorimer.

Even assuming that this evidence establishes a date of conception by Faller in the spring of 1896, the record fails to show that he was proceeding with reasonable diligence when Lorimer & Lorimer entered the field, so that in this view of the case he cannot prevail.

There is no error in the findings of the examiners-in-chief and their decision in awarding priority of invention to Lorimer & Lorimer is therefore affirmed.

DRAGON CONTROLLED BY TELEPHONE.

Our Chinese friends will be interested in the way foreign devils control dragons. In the opera "Siegfried" a dragon is an important feature of the entertainment. This opera was rendered at the Metropolitan Opera House in New York recently. The insides of the dragon, which is made of canvas and papier-mache, hold two small boys, who are supposed to guide the beast's movements in accordance with the music. They are rarely equal to doing that correctly, even after rehearsal. The performance the other night is said to have been given without a single stage rehearsal, as no time could be found for the preparation of the opera. It was, therefore, more than ever necessary to have the occupants of "Der Wurm's" insides kept up to their business. The stage manager decided to install a telephone in the beast. It connected with the opera house switchboard. On one end was Herr Greder, the stage manager, and at the other were two receivers strapped to the heads of the two boys, who received momentarily directions as to what they should do. The dragon under the circumstances covered himself with credit.

If the telephone letter system is established by the government, thousands of miles of farmers' telephone wires will be available immediately for the purpose.

Where "Central" Goes to School

WHEN you take down the telephone receiver and ask for "Main 825," or "4501 John, please," or merely "2781 Black," you seldom think of the human link in the chain that connects you with every part of the city and the world outside. The use of the telephone is so much a part of our everyday life that we regard "Central" as a vague mechanical entity that repeats a certain number of set phrases like a trick doll responding to a spring. Once in a while, when we try her patience beyond endurance or make especially rude remarks over the wire, we are brought back to the knowledge that she is human. But for the most part our knowledge of the telephone girl comprehends merely a low, clear voice that comes over the wire saying, "Number?" "Seven-nine-four." "Line busy."

As a matter of fact "Central" is very much alive, and those who wear her title compose an army of 20,000 in New York city alone. In preparing for her work she takes a special course in a school that exists for her special instruction. Under present-day conditions it would be just as impossible for a girl to succeed as a telephone operator without careful training and instruction as it would for her to become a telegrapher or stenographer. There are only five telephone schools in the United States. The largest of these is the one maintained in the new Gramercy Exchange building in Irving place, New York city. From seventy-five to a hundred girls are constantly enrolled in the school in order to keep up the supply of operators in the various exchanges. The instruction staff consists of fifteen monitors and superintendents.

There are several lecture rooms. The work begins with a rudimentary instruction given on the blackboards. As soon as the class is far enough advanced its members are placed at the switchboards in the main instruction room. There are several teachers in this room. They act the part of the subscribers and call for numbers and put the pupil through the ordeal which will be her daily lot when she reaches a switchboard in a central office. Four weeks is generally sufficient for the average girl to master this preliminary instruction. During the time the girls are in school they are paid $3 a week. As the work is pleasant and the hours not long there are naturally a great many applicants. A large number of applicants are rejected at the first examination. Particular attention is given to the applicant's voice, for clear tones and a proper enunciation are just as essential in a telephone operator as they are in a choir singer or an elocutionist. The girl's manner and temperament are carefully observed, too. If she becomes nervous or irritable in answering questions, if her hearing is defective or her eyesight poor, she is told at once she will not do.

"Our most difficult task is to find girls with clear, distinct voices," said the superintendent of the telephone school in discussing her work. "Most girls pitch their voices too high and talk too fast. We reject more applicants for this reason than for any other, and many of those we do receive have to be drilled in speaking quite as carefully as in switchboard work.

"We take girls anywhere between 16 and 22 years old, but the former age is preferable, for the younger girls learn more readily and are likely to remain with us longer. I should say that the majority are 17 or 18 when they enter the school."

From four to six weeks of special instruction, including the daily practice in rapid-fire telephone talk under the direction of the monitors, usually enables the pupil to master enough of the business to take her place in a regular exchange. When she begins her practical work "Central" still receives $3 a week for a few weeks, and then her pay is increased gradually as she becomes more adept and more valuable to the company. The best paid of the operators receive about $10 a week.

While the telephone girl is on duty in a central exchange her work is exacting and requires her to be constantly on the alert. But there are frequent rests. Every important central exchange has lounging and reading rooms for the employes. These are fitted up with comfortable chairs and couches and the periodicals of the day are supplied for the girls to read. Beside these there are lunch rooms, where the company supplies hot tea and coffee free and where the girls eat their lunches.

The telephone girl's working hours are spent in an operating room, which is usually in an upper story, to take it away from the noise and dust of the street. Here perhaps fifty girls will sit together in long rows, each with a receiver fastened to her left ear, in order to leave both hands free. Thousands of little electric lamps are constantly flashing on the face of the switchboard, and in obedience to their signals the hands of the operator fly back and forth as they connect line with line. There is little noise, for everybody talks in a low tone and the switchboard itself is practically noiseless. Behind the rows of the operators supervisors move back and forth, and at desks in the center of the room are the monitors and the chief operator, all of whom have telephones connected with the switchboard.

After about two hours' work in her place before the switchboard an operator gets a rest of half an hour, and this, if she is so disposed, she may spend in reading or chatting with her friends in the restroom. After another two-hour period she has an hour for lunch. The same routine is repeated in the afternoon.

The prevalent idea that the telephone lacks secrecy and that the operators can listen to the conversations that go on over the line is a mistake. The central switchboard apparatus is so constructed that after an operator has joined one line to another she cannot hear the words going over the wires. Persons who flatter themselves that all of their telephone conversations are of such exceptional interest that the operators in the central office are listening eagerly labor under a great delusion.

While the telephone operator has no interest in the ordinary call except to connect one line with another which is asked for, there are times when she comes to the assistance of the subscriber and shows that she is quick witted and resourceful. There is on record a case where a burglar was apprehended because of the action of a young woman at central. Moving about in a dark store, the burglar knocked the telephone receiver from its hook. When he did that a signal lamp gleamed upon the switchboard at the central office and the operator there, supposing that somebody was calling her, asked for the number wanted. Instead of a voice

at the other end of the line, she heard the noises made by the intruder as he stumbled about the store, and she jumped to the conclusion that she was listening to a burglar. It took but a moment to notify the nearest police station, and when he left the building the burglar, detected by telephone, walked into the arms of a policeman.

To know how to act promptly in emergencies is part of the education of the operator. If you are aroused from sleep in the dead of night to find your room filled with smoke the quickest way in which to summon the firemen is to telephone to "Central." Keep cool enough to tell the operator the location of your house and she will do the rest. She has been taught just how to reach the proper fire station in the shortest time, and after you have told her that your house is on fire you may proceed to look after the safety of your family and valuables without worrying about the firemen. The girl at central will tell them about it and send them hurrying to your assistance.

The emergency call, whether due to fire, accident or crime, finds the telephone operator ready and willing, and she knows what to do. When she hears somebody calling, "Give me the emergency hospital quick," she does not have to hunt in a telephone directory, for she carries the hospital's number in her mind, and this is a case where the connection is made regardless of whether the line is already in use or not.

Every central office at times becomes a bureau of information for the benefit of subscribers. When there is a great fire or anything happens in which there is great public interest "Central" answers again and again the questions of the people who want to know all about it. She is told by the chief operator, or some other person in authority, what information to give, and as subscriber after subscriber calls for information she patiently repeats what she has been told. As to the personality of these young women at the switchboard, practically all of them are native born and most of them are of Irish or German extraction. In reply to a question as to what nationality furnished the best operators the superintendent of the school in New York said:

"I think the ideal operator would be a girl with a German mother and an Irish father. The Irish girls are very bright and they learn quickly, but they have not, as a rule, the even and calm temperament of their German sisters. The one is apt to be a little pert and impatient, while the other is sometimes too slow to be a really first-class operator. Most of the girls we take are of Irish or German stock who were born here and have received a good public school education."

"What is the effect of the work on the health of the girls?" was asked. "Doesn't the constant answering of calls cause a great wear and tear on the nervous system? One would suppose that deafness and a loss of voice might often result from such a continual use of the organs of speech and hearing."

"A woman can use her voice a long while and pretty constantly," replied the superintendent with a smile, "without losing the use of it. And as to the danger of becoming deaf, the result is quite the contrary. One's hearing improves instead of growing worse. Why, I heard of a woman the other day who had a telephone put in expressly to see if it would remedy her impaired hearing. There is undoubtedly more or less nervous strain on the operator, but not any greater than in several other occupations—typewriting, for instance—and it is very seldom that a girl has to give up the work on that account."

When the visitor walks through one of these great operating rooms the youthful appearance of the operators naturally suggests the question of what becomes of the telephone girls. When this question was put to the chief operator she smiled as she answered with a single word: "Matrimony!" It is true that most of the telephone girls marry, but their romances do not begin over the wire. There may have been a time when the "hello girl" who has vanished engaged in light and airy conversation with the subscribers, but that time was back in the infancy of telephony.

To-day in a large exchange the young women at central knows the subscribers only by number. Her communications with them are not confined to the scriptural "yea, yea, and nay, nay," but are about as brief. "Number?" "Nine-nine-four-seven," or the repetition of other numerals, and the occasional statement that "the line is busy; please call again," however sweetly spoken, are not likely to lead to an acquaintance, even with the most impressionable of young men.

Most of the girls do not remain in the central exchanges longer than a year or two, however. Many of them leave to take charge of private branch exchanges in offices, hotels and apartment houses. There are more than 16,000 of these branch exchanges in New York city, so that the demand for capable operators is constant. The pay is better in private exchanges and the girls have more liberty.

"CYCLOPEDIA OF APPLIED ELECTRICITY."

The "Cyclopedia of Applied Electricity" is published in five volumes containing about 2,500 pages and over 3,000 illustrations. It is bound in three-quarters red leather. The list price is $30; special introductory price $18. Published by the American School of Correspondence, at the Armour Institute of Technology, Chicago.

This work is the most comprehensive work on electricity and its practical applications that has yet been published and will prove invaluable to electricians, engineers, telephone and telegraph operators, engineering students, and any person who has occasion to use electricity in any form. To be able to turn quickly to any phase of electricity as used in our great industries is of immense value to both the busy practical man and the engineering student. In these volumes the reader finds a treatment of the latest developments of electricity by acknowledged authorities, fully indexed, and written in a simple, direct way, free from difficult mathematics and especially adapted to the needs of the busy practical man.

The work is not addressed to the technically educated specialist, and for this reason all of the descriptions and explanations which it contains have been simplified to the utmost possible degree consistent with a thorough presentation of the subjects treated. Higher mathematics have been entirely omitted, and the subject matter of the work is explained in simple language in connection with a large number of diagrams prepared especially for the text. The halftone engravings are of special value, as they illustrate all of the electrical machines and apparatus made by the prominent electrical companies in the United States and therefore acquaint the reader with the types of apparatus used in current engineering practice.

The usefulness of the cyclopedia as a reference book is augmented by the addition of a subject index contained in the fifth volume. The practical value of the work as a whole can hardly be questioned, as the cyclopedia embodies the various electrical courses which have been successfully used by the American School of Correspondence in teaching thousands of electricians. The work is, in fact, the outcome of a most successful method for the education of the busy man. It will be found of the greatest value to designers, constructors and operators of electrical machinery, and as it is the only textbook and reference work covering every department of electricity thoroughly, its use will save many valuable hours of search among scattered text-books on electricity.

The Ft. Wayne & Wabash Valley Traction Company is now operating its lines by dispatchers instead of by the block system it formerly employed. Telephones are used.

Telephone Tales Tersely Told

The city council has granted the Fairbury (Ill.) Telephone Company a twenty-year franchise.

The Nevada (Iowa) Mutual Telephone Company will erect a new exchange building to cost $3,000.

The Clark Automatic Telephone Company has installed a telephone system at Sergeant Bluffs, Iowa.

The Panama and Merchants' Telephone Company of Panama, Iowa, is planning numerous extensions.

The Crawfordsville (Ind.) Independent Telephone Company is figuring on installing an automatic system.

The Portage County (Ohio) Telephone Company has 2,000 subscribers, and the system is rapidly growing.

The Conneaut (Ohio) Telephone Company has 770 telephones in service and applications for many more on file.

The Keystone Telephone Company of Philadelphia will be reorganized financially and otherwise developed without further delay.

The Niagara County (N. Y.) Home Telephone Company will erect a new exchange building, with the latest and best equipment.

The Commercial Telephone Company of Warsaw, Indiana, will install a new system of greater capacity and more modern appliances.

The Woodbine Telephone Company of Woodbine, Iowa, has 1,350 instruments in service. The company operates ninety-eight rural lines.

The Metamoro Telephone Company has purchased the interest of the Central Union Telephone Company at Metamora, and will enlarge its system.

Any city in Minnesota can build or buy a telephone system on the decision of a majority of the voters, under a bill introduced in the senate by F. H. Peterson of Moorhead.

The Hamilton (Ohio) Home Telephone Company has made an offer for the purchase of the Bell Telephone Company's interests in Hamilton, and negotiations are now pending.

The Citizens' Telephone Company of Racine, Wisconsin, will install an automatic system, and plans to spend $150,000 for this purpose and the erection of a new exchange building.

The Concordia, Kansas, telephone system has passed into the hands of a new company, of which F. W. Daugherty is president and general manager and F. J. Hannum secretary-treasurer.

The Cass County (Ill.) Telephone Company has purchased the Bell exchange at Virginia, Illinois, and will consolidate the two. The Bell, having lost all its business, did the next best thing.

The Lebanon (Ind.) Telephone Company will convert its present plant into an automatic system during the coming spring or early summer, which will mean the expenditure of several thousand dollars.

The Laporte (Ind.) Telephone Company has expended $15,000 in improvements during the past year. This company now has 30,000 feet of new underground conduits and 4,000 feet of underground cable.

The Home Telephone Company is installing an exchange at Lee Summit, Missouri. The system will start with 250 subscribers, and it is expected to increase the number to 400 by the end of the first quarter.

The Tri-State Telephone Company of Minnesota has once more failed to secure permission from the city council to extend its lines through Fargo, North Dakota, and will continue condemnation proceedings.

The Consolidated Telephone Company, which recently acquired all the various telephone systems in the vicinity of Clifton, Tennessee, has made arrangements to put in a local exchange at Waynesboro, Tennessee.

The secretary's report of the Farmers' Telephone Company of Benton County, Iowa, shows the company to be in excellent condition. The company now has twenty-eight lines centering in Vinton, on which are 500 telephones.

A franchise has been granted to Edward L. Webster to operate a telephone and telegraph system in Tacoma, Washington. It is the intention to lay underground conduits. It is proposed to spend $50,000 the first six months.

The Atlanta (Ga.) Telephone Company is preparing to make extensive improvements and enlargements to its system. Additional sections of switchboards have been ordered, together with 90,000 feet of cable for distribution purposes. The forthcoming improvements will include the districts of West End, Brookwood, Bellwood and East Atlanta, giving to them a service equal to that now furnished to Atlanta.

The splendid new exchange of the Vermilion County Telephone Company at Danville, Illinois, was recently thrown open to the public. It is claimed to be one of the finest telephone systems in the country in a town of Danville's size.

N. S. Wing of the Citizens' Telephone Company of Grass Lake, Michigan, announces that he recently drove ten miles in the country, installed fifteen telephones and returned, all in one day. He performed the work alone. Who can beat it?

A bill has been introduced in the Missouri senate by Senator Clarke of Kansas City, giving cities in that state of 100,000 population and over the right to fix charges to be made for the use of telephones The bill affects St. Louis, Kansas City and St. Joseph.

The Clinton Telephone Company of Wilmington, Ohio, which began business five years ago with 125 subscribers, organized to accommodate the village, now has 1,954 subscribers, with exchanges in six of the larger towns of the county and twenty toll stations.

Messages were lately telegraphed and telephoned simultaneously on the telegraphone between Chicago and Peoria, Illinois, and the experiment was pronounced an entire success. The inventor of the device is H. C. Rugh, who holds patents in twelve different countries.

The Citizens' Telephone Company of Decatur, Indiana, has just purchased a new exchange building at a cost of $6,000. The company will make improvements and extensions to its system in the spring, changing to the full metallic system and increasing the switchboard capacity.

At a meeting of the Cascade Rural Telephone Company of Great Falls, Montana, it was determined to extend the present line from Black Butte to Evans. A large number of farmers along the route have promised their support, and almost the needed amount has been subscribed.

A private company, headed by C. C. Haas, a wealthy farmer, is about to be organized to build a telephone line from the Belle Fourche River to Whitewood, South Dakota. The line will pass through a well settled district, and will be the only Independent county line in the Hills.

The final hearing in the United States court in the suit of the city of Eansville, Indiana, vs. the Cumberland Telephone Company to oust it from the streets of the city on the ground of expiration of charter rights has been postponed until April. The attorneys for the city desired to file an additional brief.

The Hastings (Neb.) Independent Telephone Company will, as soon as the ground thaws, begin the grading for its new building. This company now has over 110 stockholders, representing more than $40,000 worth of stock, and by next year expects to have in operation in Hastings one of the finest plants in the state.

Circulars announcing a reduction in its rates for business telephones have been issued to patrons by the Rocky Mountain Bell Telephone Company. This action has resulted from the activity of a citizens' committee appointed some weeks ago at a mass meeting called for the purpose of securing concessions from the company.

A bill has been introduced in the Illinois legislature which is of particular interest to Chicago, as its passage would compel the Chicago Telephone Company to permit Independent companies access to Chicago through a provision for interchangeable service. The bill aims to give cities and villages power to regulate telephone rates.

The Detroit (Mich.) Co-operative Telephone Company is preparing to enlarge its plant. It is said the Peninsular Telephone Company, with headquarters at Bellevue, and which operates the toll lines with which the Co-operative company connects, is planning to spend $25,000 in putting in six copper conduit wires in Detroit. The Co-operative company will soon have a complete plant.

The farmers' telephone companies of Whiteside, Bureau and Carroll counties, Illinois, are planning to organize into one large company, and for that purpose have formed a preliminary organization with the following officers: President, D. D. Stitzel, Lanark; vice-president, F. Trautwein, Morrison; secretary, H. G. Hotchkiss, Prophetstown; treasurer, E. S. Swanson, New Bedford.

Within the past eleven months the United States Telephone Company has added almost 150 miles of new construction. Among other circuits added were those from Dayton, Ohio, west into Indiana, a trunk line from Cleveland to Milan, Ohio, and a connection for Ohio lines to Wheeling, West Virginia. Cleveland now has excellent service to Wheeling, a field that is particularly desirable to

reach from the Lake Region, because of the large coal fields that are being opened up in West Virginia.

The exchange of the Interstate Telephone Company at Hampshire, Illinois, is growing very rapidly, having at the present time 250 telephones in operation and orders for nearly fifty more on its books. The Hampshire *Register* says that "Manager Culetan has enough work ahead next spring building new lines and putting in new telephones to keep a gang of men busy for the next year."

W. H. Burke of Clifton Springs and W. C. Ellis of Shortsville, New York, who have been interested in several telephone companies operating in Ontario county, have sold their interests to the Inter-Ocean Long Distance Telephone Company of Buffalo. The company more particularly affected by this sale will be the Clifton Springs Telephone Company, which has been operated and controlled by them.

The Union Electric Telephone and Telegraph Company of Rock Island, Illinois, reports that its business has increased thirty per cent during the past year. The exchanges in Moline and Rock Island are working to their capacity and until additional cable can be laid no extra effort will be made in soliciting additional business. An extension to East Moline and an exchange at that suburb will be installed at once.

"Madison is far ahead of Milwaukee from a telephone standpoints," says H. C. Winter of Madison, secretary-treasurer of the Independent Telephone Association of Wisconsin. "Our company at Madison, an Independent one, has 2,300 subscribers. The Wisconsin Telephone Company at Madison has about 600. On that basis Milwaukee ought to have 40,000 telephones to satisfy its population, instead of about 14,000."

William Proskauer of West Bay City, Michigan, has completed an apparatus which may be attached to either short or long-distance telephones, enabling users to obtain clearer and better service, and avoiding the usual buzzing. The arrangement is fitted in the mouthpiece. It is only necessary to have one battery, thus making the box smaller and shortening the upright part of the telephone. He has applied for a patent on his device.

The new telephone system of the St. Louis County (Mo.) Telephone Company, an Independent organization, is in operation. The company has started in to cut rates and furnishes a telephone in a residence for $1.50 a month and in a business house for $2 a month. While the system was built primarily to afford local communication, arrangements have been made whereby St. Louis connection can be secured by the payment of a toll fee.

The Decatur (Texas) Telephone Company has recently installed new cables, terminal boxes, inside cables, connecting racks and protective devices, and is constructing numerous short toll lines and extending its country lines, which brings the Decatur exchange right up-to-date. At the present rate of increase of subscribers Decatur is sure to become a good telephone center. R. E. Moore, the proprietor and manager, is always on the lookout for the best going for his satisfied subscribers.

Within the past eleven months the United States Telephone Company has added almost 150 miles of new construction. Among the circuits added were those from Dayton, Ohio, west into Indiana; a trunk line from Cleveland to Milan, Ohio, and a connection for Ohio lines to Wheeling, West Virginia. Cleveland now has excellent service to Wheeling, a field that is particularly desirable to reach from the lake region, because of the large coal fields that are being opened up in West Virginia.

The telephone business of Tama county, Iowa, is becoming an enormous enterprise, although its growth is only fairly started. But a few years ago there was not a line in the county. Now nearly 100 companies are doing business, most of them farmers' companies, of course. The lines are all the way from one to twenty miles long. There are three commercial lines only that cover any great portion of the county—the United States, which has the exchange in Traer; the Commercial, which operates in and out of Toledo and Tama, and the Iowa, which has no exchange save a small one in Dysart.

The board of trustees of Mt. Morris, New York, has granted a new franchise to the Inter-Ocean Telephone and Telegraph Company for the erection of a local telephone exchange in that village. Within the past year a local company has been organized by the Inter-Ocean Telephone Company under the name of the Livingston County Telephone Company for the purpose of developing the Independent telephone business in Livingston county. The company already has more than 500 telephones in operation in the county and proposes to increase this number to at least 1,500 within the next year.

The Walworth County (Wis.) Telephone Company, which operates exchanges at Delavan and Elkhorn, is in a highly prosperous condition. Five years ago the company started business with forty-eight telephones at Delavan and forty at Elkhorn, and without soliciting any subscribers the business has grown till now it has 315 telephones at Delavan, with over twenty on the waiting list, and at Elkhorn it has 124. The Bell company has only fifteen subscribers in the former town and forty in the latter. The citizens of both places are delighted with the service given by the Independent company.

General Greely, chief signal officer, has awarded a contract for telephone equipment to be installed at the coast forts, following the plan of a fire control system, to Lambert Smith & Company, Chicago, providing that firm can deliver the telephones in the specified time. The present contract, which does not amount to over $10,000, will, in the case of a satisfactory finding of the board on the working of the telephones, run into several hundred thousand dollars.

That the telephone is well patronized by the people of South Dakota is shown by the increase in numbers of companies, year by year, as reported to the state auditor. In 1900 there were thirty-five companies operating in the state, with 2,908 miles of line. The 1904 report of the state auditor shows 106 companies in the state, with 9,782 miles of line. The increase has been greatest the past two years, as only thirty-five companies reported in 1900, with thirty-seven in 1901, forty-seven in 1902, seventy-three in 1903, and 106 in 1904. By far the greatest increase has been among the Independents.

At a recent meeting of the business men of Cadillac, Michigan, it was unanimously decided to use the service of the Citizens' Telephone Company, and discard the Bell. The service at Cadillac is being much improved, and a new toll line from Cadillac to Harrietta has just been completed. The Citizens' company now has 755 telephones in service at Cadillac and seventy-five more orders which are being filled, whereas the number of telephones three years ago, when the Citizens' company entered the field, was but 209, showing the remarkable growth which has been made by the company there.

It is stated that there never was a time in the history of Cleveland when things looked brighter for the Federal Telephone Company and its subsidiary companies than at the present time. The Cuyahoga is prospering beyond all expectations, and the United States company is in fine condition to make an unusually good showing during the year 1905. A man who is pretty familiar with the Federal affairs says that if the Cuyahoga and United States reach expectations, and there is every indication that they will during this year, the common stock of these companies owned by the Federal will pay the Federal debts.

NOTES FROM THE RURAL DISTRICTS.

Telephone is all the talk in Madison—too bad that people cannot "let well enough alone," too much spite work will do a great deal of harm. The Jack-Oak line has been kept up and it cost no outsider one cent and still it has brought cents to others for talking over it. Don't think good nature can be imposed upon always; wait the development of things with the coming of spring when the ground thaws out and we can cut some more Jack-Oak poles and then we will talk, and ask odds of no one.—*Madison Musings in Sidney (Iowa) Herald.*

The Thompson Telephone Company and the LeRoy Telephone Company, we hear, have agreed to meet lines, and each company has stretched out until each one has reached the banks of Hades valley, one company on one side, the other one on the other side. There they have stopped, neither daring to try to cross the valley, each one daring the other to start, like a lot of boys. We admit it takes courage to wade into the valley, but you had better roll up your sleeves, spit on your hands like men and make a dive and we think you will either get through or stay there. (We don't charge anything for this advice.)—*Leroy Lisps in Painesville (Ohio) Telegraph.*

Last Friday evening number 1000 telephone company with well filled baskets went in and surprised John Clausen. It's needless to describe how John looked, but he recovered enough to entertain his guests in a royal manner. So well pleased was he with the supper the cooks set before him that he seriously meditates the question of becoming a "benedict"; he now announces himself on the market for any pretty lass who can cook him a good meal. The evening was pleasantly spent in singing and playing games. The company started for their homes at a late hour, wishing John many happy returns, and all decided John was O. K. as to entertaining.—*Route No. 2 Items in Stony City (Iowa) Herald.*

When the farmers of this locality first met to consider the feasibility of constructing a telephone line at a minimum cost there were many doubting Thomases who appeared on the scene with a joblot of stuff about the absurdity of such talk. They produced all kinds of objections to antagonize the movement. The promoters, however, kept hammering away until the movement ripened into a vivid reality. The line was constructed at the small cost of some $25 per each stockholder. This includes 'phone. The fever spread until there is an excellent prospect of three other lines being built shortly. There is no good reason why the farmers all over this country should not be able to swap yarns relative to politics or farming. The farmers are the salt of the earth and are justly entitled to enjoy all the blessed privileges this mundane sphere affords.—*Anthony (Kan.) Bulletin.*

Hogeboom & McLane have installed a new telephone system at Rockham, South Dakota.

D. E. Miller of Flora, Indiana, has purchased the Wayne (Neb.) Independent Telephone Company.

Charles C. Deering has resumed the management of the Boone County (Iowa) Telephone Company.

Ray H. Manson, advertising manager of the Dean Electric Company of Elyria, Ohio, while in Chicago recently on business made the office of TELEPHONY a pleasant visit.

Miss Blanche Rothschild has been promoted to the position of local manager of the Independent Consolidated Telephone Company's exchange at Lancaster, Wisconsin.

J. W. Savage of Warren, Arkansas, manager of the Valley Telephone Company, says the company is preparing to rebuild a long-distance line from Varner to Redfork.

W. F. Goodrich and N. D. Burford of La Crosse, Wisconsin, have been interesting the citizens of New Amsterdam, Wisconsin, with a view to installing an exchange there.

Dr. D. W. Straight of Benedict, Nebraska, has been appointed manager of the Hastings (Neb.) Independent Telephone Company, which is building a new $50,000 system in that city.

Marcellus L. Joslyn has sold the telephone line recently operated by him at Hebron, Illinois, to the Farmers' Telephone Company of that place, at the head of which is George H. Hunt.

N. A. Kinney, president of the Rolla (Mo.) Telephone Company, contemplates the establishment of a complete telephone system at Newburg, Missouri, with connections to all parts of the county.

J. B. Long of the Amity (Ore.) Mutual Telephone Company reports that an Independent mutual telephone company has been organized at Belleview, Oregon, and that work on its line will be commenced at once.

George W. Hart, proprietor of the Egan and Flandreau, South Dakota, telephone exchanges and the rural lines connecting these places, has sold his interest to C. B. Miller of Egan and John Miller of Flandreau for $12,000.

T. A. Anthony and Emil Engdahl have closed a deal for all the stock in the Union Telephone Company of Wausa, Nebraska, which gives them control of the exchanges at Wausa and Bloomfield and the line to Croton.

K. D. Chase and others have been granted a franchise by the city council at Faribault, Minnesota, and will once proceed to install a local telephone system in Faribault. They have already constructed several rural lines.

Capt. Bill Hennessey of San Antonio, Texas, is interested in the extension of a telephone line from Alice to Falfurrias, Texas, making connections with the principal ranches along the route, and later to extend to Hidalgo and Rio Grande.

Will Graham, superintendent of the Lafayette County Telephone Company of Lexington, Missouri, recently talked from Mexico, Missouri, to Lexington, via St. Louis and Kansas City, over Independent lines, a distance of about 600 miles.

H. M. Spere of Lincoln, Nebraska, has bought the Independent franchise in the town of Axtell from John McCormick of Omaha. He will organize a company with a capital stock of $100,000. Mr. Spere already has some of the largest Independent interests in the west.

Charles F. Speed, who has been local manager of the Washtenaw Telephone Company, at Ann Arbor, Michigan, since its organization, has been appointed construction manager, and will have charge of all the construction work of the company wherever new lines may be put in.

Thomas O'Rourke has resigned as local manager of the Delaware & Madison Counties Telephone Company, Anderson, Indiana, to go to Shreveport, Louisiana, to take charge of a similar plant. He is succeeded by W. J. Chance, formerly of Connersville, whose headquarters will be in Anderson.

E. J. Burns of Rock Island, Illinois, has been promoted to the position of manager of the Rock Island and Moline exchanges of the Union Electric Telephone Company, while H. H. Bratt, who has been manager of the tri-city exchanges for the past year, will be manager of the Davenport, Iowa, exchange.

E. J. Pietzcker, who for two years past has been attached to the western sales department of the Standard Underground Cable Company of Pittsburg, with headquarters in Chicago, has been placed in charge of the company's new southwestern sales office in St. Louis, being located in the Security building. He is a capable man and will no doubt win fresh laurels in his new position.

E. R. Rowen, formerly of the B. F. Goodrich Rubber Company of Akron, Ohio, has been appointed manager of the company's Chicago office, succeeding in that capacity R. P. Whelpley, who resigned after twenty years of successful service.

H. G. Guyle, a stockholder in the Star Telephone Company of West Union, Nebraska, is at present making an extended stay in Chicago, where he is engaged in working on a selective lockout device, which he expects to have perfected in the near future, when he will apply for a patent on same. Mr. Guyle is working along entirely new lines and believes he has solved the lockout problem.

C. A. Stone read a very interesting paper before the Chicago Telephone Company's school of instruction recently. The school is for inspectors, repair men and other employes of the company. Meetings are held twice a month during the winter and are divided among the different exchanges, there being three or four exchanges in each division. Mr. Stone's paper appears in another part of TELEPHONY.

George A. Briggs, president of the Chicago Telephone Supply Company of Elkhart, Indiana, attended the Independent telephone conventions at Lincoln, Nebraska, and Topeka, Kansas, and made attractive exhibits at both places. Mr. Briggs also was recently in Colorado Springs, Colorado, where he completed arrangements to supply the El Paso Telephone Company of that city with telephones.

George H. Glass, general manager of the Pekin (Ill.) Telephone Company and president and general manager of the Independent telephone company recently organized at Petersburg, Illinois, visited Chicago the latter part of February and purchased apparatus to the amount of $5,000 for the Petersburg system, which will be installed at once. Mr. Glass is a well-known, enterprising and successful Independent telephone man.

G. M. Gest, the expert subway contractor of New York and Cincinnati, and a crew of fifteen assistants recently sailed on the steamer Vigilancia, bound for Mexico. Mr. Gest has the contract in Mexico City for the building of a subway system through the entire city. This is one of the largest contracts Mr. Gest has ever undertaken, but is not the only foreign project in which he is interested, it being his intention to send other crews abroad on work which is now being put in contract form.

L. G. Monroe, C. A. Fleming, M. H. Eggleston, H. A. Hover, W. M. Quinn and E. H. Jamison, representing the city council, Chamber of Commerce and Taxpayers' League of Spokane, recently inspected the Home automatic telephone systems at San Diego and Los Angeles, California. A company has made application for a telephone franchise in Spokane, and the Spokane delegation was seeking light on the Independent telephone situation in general, and the automatic system in particular, with a view to passing on the same as applied to Spokane.

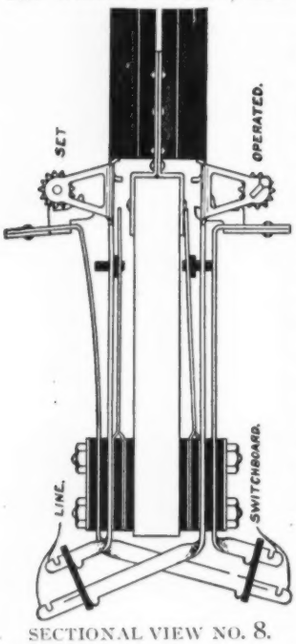
Dr. W. Elwell Goldsborough, director of the school of electrical engineering, Purdue university, Lafayette, Indiana, and during the past three years chief of the department of electricity at the Louisiana Purchase exposition, has become associated with J. G. White & Company, New York city. Dr. Goldsborough will ultimately be permanently located in New York. For the present, however, his time will be divided between Lafayette and New York city. Dr. Goldsborough recently was decorated by the king of Italy with the order of Knight of the Crown.

F. E. Leonard, manager of the Rocky Mountain Bell Telephone Company at Butte, Montana, has been appointed manager at Salt Lake City, assuming his duties about February 16. His successor at Butte is George Armstrong, who has held a responsible position with the Chicago Telephone Company for many years past. Mr. Leonard was formerly with the Chicago Telephone Company, where he held the position of superintendent of underground construction for many years. He bears the reputation of being an up-to-date, practical, energetic and very efficient man in the line of telephone construction; he likewise has a host of friends who will join in congratulations on this evidence of prosperity and honor accorded to a most worthy subject.

L. T. Dunlap, formerly of Neosho, Missouri, has accepted a position as traveling representative for the Monarch Telephone Manufacture Company of Chicago. Mr. Dunlap is a man of wide experience in the telephone field, having been interested in several exchanges in southwest Missouri. Even before the Bell patents had expired he manufactured telephone instruments for his own use, and since the expiration of the patents he has been actively engaged in constructing and managing telephone systems. This practical experience will greatly aid him in his present work, and should help to introduce him to many exchange managers and telephone men. Mr. Dunlap is perfectly familiar with the apparatus he is now to handle, having used it for the past two years in the exchange at Neosho. This familiarity, together with the reputation Monarch goods have already secured, will undoubtedly bring him the success he deserves. Mr Dunlap's territory is to be the states of Kansas and Missouri.

A SIMPLIFIED PROTECTOR.

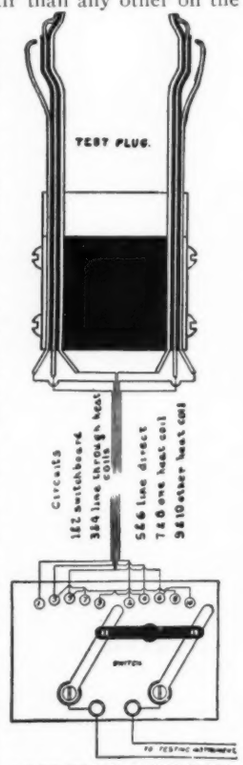
The subject of adequate protection for central stations is one which has been, and is, receiving a great deal of attention both from operating companies and manufacturers, and the importance of the subject has been in nowise over-estimated. Simplicity is the keynote to all the manufacturer's efforts at improvement, and this simplicity must be secured without any decrease in the efficiency of the apparatus. Simplicity in protective apparatus is particularly desirable, as any step looking to a decrease in the number of parts almost necessarily means a great increase in efficiency. Frank B. Cook is offering an evolved type of protector, of which he says:



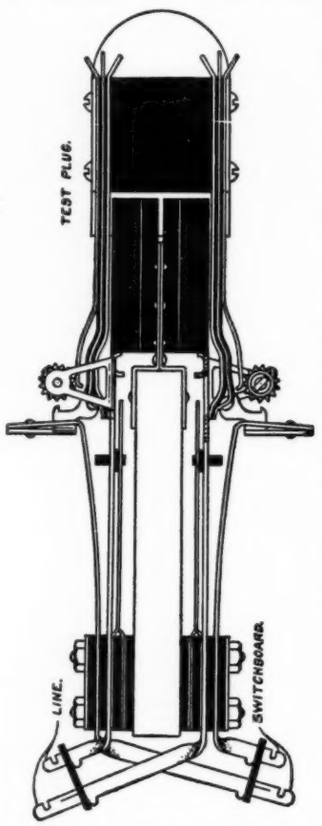
SECTIONAL VIEW NO. 8.

My latest central station protector No. 8 represents what I believe to be a very marked advance. It is my No. 444 simplified and improved, while still adhering to the same general design. The result of this effort is my No. 8, and I claim it to be a simpler protector in point of number of pieces per pair than any other on the market. It has only four spring pressure contacts normally in series in the line circuit for each pair, and two of these have two points of bearing each. In point of ease of restoring the coils to position after operating, it is necessary only to press the circuit controlling spring back into position, which can be done in one operation. The coils themselves never have to be removed or replaced. All the parts are mounted on a heavy metal bar, and this bar is intended to be permanently connected to earth.

My No. 8 differs from any other protector, because no bolt or soldered connection in transposing the line and switchboard terminals is required. All the alarm springs are connected to a common conductor, which is intended to be connected to an alarm signal, the other side of the signal to be connected to earth. This automatic alarm has been the source of considerable trouble, but I know that this point has been so carefully worked out in my No. 8 that the alarm will always operate. The alarm circuit is closed through only one contact. The heat coil comprises a metal pin, soldered by an easily fusible solder to a metal spool, upon which is wound several inches of silk insulated resistance wire. An abnormal current passing through this wire heats the spool and melts the solder. The insulation separating the wire from the spool is about .002 of an inch thick. The metal shell which encases the coil proper is formed over at both ends, completely encasing the fusible solder. The solder is thus protected from atmospheric exposure, and on account of this protection it is impossible for the solder to corrode. This exceedingly important feature insures the resoldering of the coil after every operation. As the heat producing coil is concentrated around the fusible solder, the heat is applied directly to the solder, thus insuring quick and uniform operation of the coil. The winding, spool and all vital parts of the coil being enclosed, all heat is retained. A variation in outside temperature or air drafts will not affect the operation.



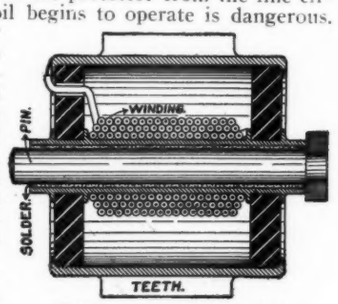
TEST PLUG & SWITCH.



SHOWING TEST PLUG INSERTED

When this coil operates, it turns on the pin through only a small arc of a circle, allowing the solder to give or stretch slightly, like gum, without actually breaking the connections. The low fusing point of the solder used insures its melting before the winding can become hot enough to injure the coil. It is, therefore, impossible for the coil to burn out, because a current strong enough to burn iti will first make it operate, opening the circuit through the winding. This heat coil and protector, when operated by either heavy or slight current, opens the switchboard circuit, closes the alarm circuit and grounds the line circuit, all in one and the same movement.

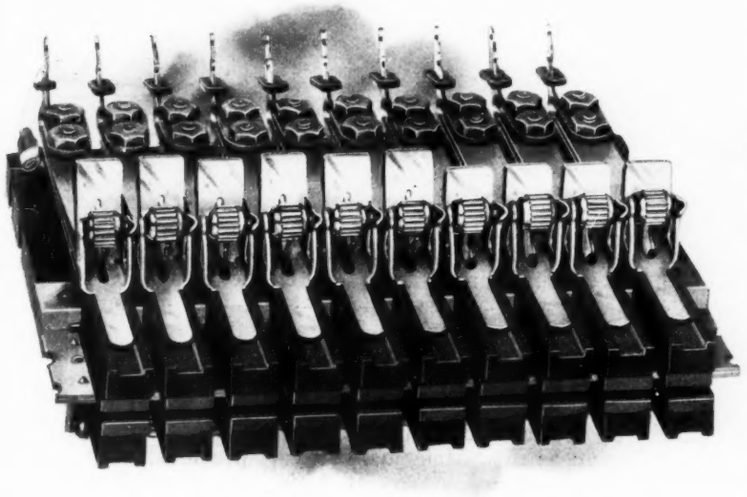
Dangerous currents against which protection is necessary may be caused by a cross between a telephone and trolley wire, with 500 or 600 volts potential, or an electric light and power circuit of from 2,500 to 10,000 volts. In any case, the current flowing through the protector at first is, by reason of the presence of a high resistance drop or relay in its path, comparatively slight. In such cases the heat coil acts slowly. But when the heat coil has acted, cutting out the high resistance drop or relay, the character of the intruding current suddenly changes and becomes far more dangerous, both to life and property, unless taken care of by the protector. One carbon of the lightning arrester is normally connected to the line, and separated from the grounded carbon by mica not less than 5/1000 of an inch thick. A potential of more than 350 volts is required to arc across this space of 5/1000 of an inch. The practice of disconnecting the carbon lightning arresters in the protector from the line circuit immediately after the heat coil begins to operate is dangerous. In my No. 8 the carbon arrester always remains in the circuit to afford protection if required. Under the above conditions, actual tests demonstrated that while more than 350 volts were required to arc across the carbon arresters, a lower voltage readily arced from the silk insulated coil wires to the ground spools, and the current generally fused the heat coil wires open.



SECTION OF HEAT COIL.
(Enlarged.)

I have had my No. 8 protector in an experimental state for almost a year, and have delayed exploiting it until all defects could be removed. Before it was advertised at all, I submitted my models to some of the most prominent and expert engineers in the country, who stated that they considered it an excellent protector.

I have already sold a great many pairs of this new protector, one of the most notable orders being for the new exchange of the Columbus (Ohio) Citizens' Telephone Company. This order was placed



BANK OF TEN PAIRS.

by the Automatic Electric Company, and calls for 8,000 pairs of protectors. I have been so busy filling orders that I have been unable to send out descriptive matter, but I now have some in the hands of the printer and will be glad to send it to anyone on application.

CENTRAL ELECTRIC COMPANY ARISES QUICKLY FROM ASHES.

The Central Electric Company of Chicago, manufacturers, importers and jobbers of electrical supplies, is evidently made up of men that neither fire nor flood nor any like calamity can daunt. On February 11 the plant of the company, at 266-272 Fifth avenue, was completely destroyed by fire—a blow that would stagger almost any concern, but which did not even discourage the Central Electric people, who evidently believe that "you can't keep a good man down." With characteristic enterprise, the burned out firm immediately got busy, and within an hour after the regular time for opening its office (and while the fire was at its height), it had secured new quarters at 209 Jackson boulevard. Before noon the company had installed a complete new office equipment, including typewriters, desks, stationery, etc., and by 10 o'clock at night had sent out to the trade 10,000 announcements, of which the following is a copy:

> It gives us pleasure to announce to our friends and patrons that while the fire of this morning completely destroyed our offices and warehouse and temporarily interfered with our facilities, *it did not put us out of business*, and we will not allow it to interfere with our taking care of your orders promptly.
>
> We are already temporarily established at No. 209 East Jackson boulevard, and within a very few days will have everything, we hope, running smoothly again—with a full new stock of supplies. Meanwhile we have made arrangements to take care of all orders promptly, and hope, therefore, that we will continue to receive the generous support that our trade has at all times given us.

Here's a sample of pluck and enterprise of the real American sort, and which needs no words of praise to impress it upon the minds of our readers—it speaks for itself, and is the best recommendation possible for the strength and resourcefulness of the Central Electric Company. It is just such an indomitable spirit as that manifested by the Central company in the face of a calamity that has made Chicago the marvel of the business world. Often a fire is a blessing in disguise. We trust that it may prove to be so in the case of the Central Electric Company.

WESTERN ELECTRICAL COMPANY.

It is a well known fact that while the east and middle west, in recent years, have made rapid strides in the building of rural lines, the far west has somewhat lagged behind. There may be different reasons to account for this condition, but there is no doubt that one of the most important is that the west has not the number of electrical supply houses that can be found in the east. It is true that a company may order from any part of the country through any supply house, no matter how far distant it may be, but it certainly will be admitted by every experienced buyer that the nearer you are to the source of supply, the easier it is to purchase and the easier to remain in better touch with the place of purchase.

It is very gratifying to those engaged in telephone work in the west to know that this disadvantage is now entirely removed and the people of that section of the country already have shown their appreciation thereof, and rural telephone lines are now being built in the western country about as fast as anywhere. The main reason for this change is that the Western Electrical Company, 1212 Farnam Street, Omaha, through its thorough insight into the electrical business, and understanding the requirements of the local trade, has decided to carry a full and complete line of all electrical supplies, including telephones, construction material and apparatus of every kind and a full stock of telephones, manufactured by the Chicago Telephone Supply Company of Elkhart, Indiana. The Western Electrical Company is able to sell all telephone goods at the same prices that would be made at the factory.

This company is one of the pioneer electrical supply houses in the west, being the successor of the Midland Electrical Company, which operated in Omaha prior to 1886. Through long and intimate relation with the patrons of its territory it is able to exercise great discretion in the culling of the trade and to carry in its stock in Omaha only the kind of goods that are wanted. It is always able to fill its customers' orders with intelligence, knowing and understanding the local conditions of all its territory, which is a very important factor for the proper filling of orders.

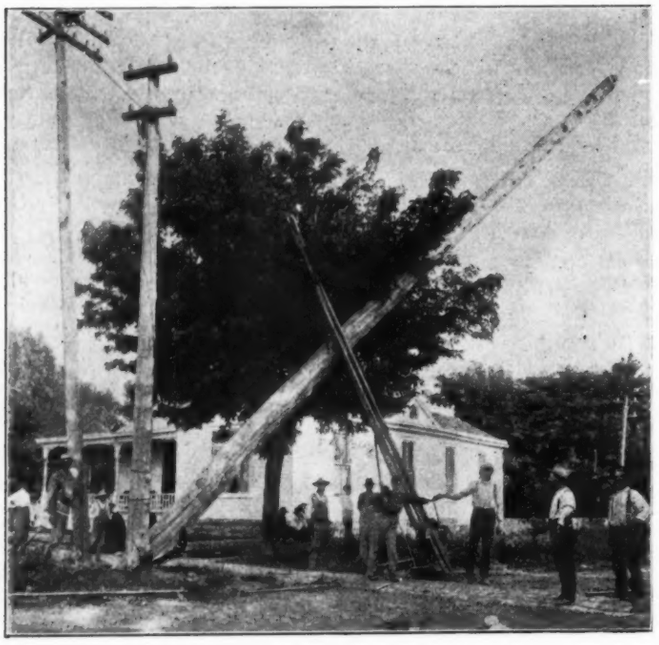
In a conversation with G. W. Johnston, president of this company, as he stopped in Chicago recently while returning from an eastern trip, it was learned that the increase in the business of the Western Electrical Company is one worthy of mention and most gratifying to the electrical trade. About two years ago, when the company plainly saw what the demand for telephone material and apparatus would be in its territory, it installed a stock in Omaha sufficient at all times to supply the needs of its trade. The result is that this company is now carrying carloads of crossarms, oak and locust pins, oak brackets, glass insulators, pole steps, machine bolts, lag screws, carriage bolts, and a thousand and one little items that are necessary and used in the equipment and maintenance of a telephone exchange. In two years the Western Electrical Company has nearly doubled its business, and is entitled to great credit for its contribution to the development of the Independent telephone business in its territory. The company is splendidly equipped in its executive offices and is well represented in the field, having five regular traveling men constantly on the road.

The Board of Trade of Vernon, B. C., has under consideration a proposal from George Williamson to put in a long-distance telephone system connecting Enderby, Armstrong, Vernon and Kelowna. The cost would be about $20,000 or $30,000, and Mr. Williamson will undertake the project as a personal venture if he can secure the support from the requisite number of people in the valley.

"LITTLE GIANT" POLE RAISER.

The Wiley-Emery Manufacturing Company of Seneca, Kansas, is putting on the market an entirely new device in the way of a pole raiser, known as the "Little Giant," and which is herewith illustrated.

The machine consists of a seven-foot base, to which is



"LITTLE GIANT" POLE RAISER IN ACTION.

attached a mast, supported and strengthened by two braces attached to the base and extending diagonally to and bolted near the top of mast below a pulley. A cable is attached to windlass and gear, between the mast and diagonal support, and extends over a roller near the middle, over a pulley at the top, and is brought down and attached to the grapple hook, consisting of a curved beak to engage pole or object. Under the grapple hook, near the mast side, is an attachment bolted on, one end of which is fashioned to fasten the end of a chain, near the center of the hook; the other end extends backward with arms to embrace the mast, with the roller between the arms to avoid friction, and holds it in position as the pole is raised. An L-shaped bracket is pivoted to the upper end of the shank of the hook, and at its angle is journaled a pulley for the cable, which may either be secured here or carried through the pulley near the top of the mast, to reduce resistance and add power. A chain is attached to the free end of the bracket, and may be placed at the outside of the pole and attached to bottom of the hook to equalize the weight and preserve the center of gravity when the hook is loaded.

GENERAL VIEW OF "LITTLE GIANT."

The "Little Giant" is indispensable to telephone and electric light plants, telegraph and railroad companies, bridge and other builders where poles, beams, piling, timbers, railings, girders and other long objects are to be raised, placed or planted. It will move a pole or object on the ground a considerable distance, and pull a pole already planted and lower it into the ground. One of its strongest features is its automatically inclining more and more toward the pole until it forces it to an upright position, the weight on the machine being relieved and thrown on the butt of the pole as it is raised until it slips in its hole. Every machine is tested on the greatest length pole it is recommended to raise before leaving the factory.

Full particulars and prices will be sent upon application, and correspondence is solicited.

MEINEMA LOCKOUT TELEPHONE.

One of the recent acquisitions to the list of manufacturers of telephone material is M. B. Austin & Company, Chicago, already well known in the telephone field, having been jobbers and manufacturers' agents of telephone supplies on a large scale for the past ten years, and who bear a reputation for marketing only the highest grade of material.

In embarking in the manufacturing business, they are practically sure of the same success that has followed them in the past, as they are presenting to the trade what is claimed to be a successful selective ringing lockout system, known as the "Meinema System," previously mentioned in these columns. Associated with them in this enterprise is A. Meinema, the inventor, well known to many of our readers.

This system differs materially from those that have previously been offered, as it is not dependent on synchronized or simultaneous contacts at "central" and subscriber for selecting, thus doing away with the element of uncertainty in selecting and calling. It is possible for "central" to call any subscriber on the line without ringing others on the same line, and absolute privacy in conversation is assured, as all telephones on the line are locked out, except those given connection by "central," a fact that will be very much appreciated by the subscriber, also by up-to-date managers who believe in extending to their customers the best possible service. It is not necessary for the subscriber to lift the receiver and listen to ascertain if the line is busy, for the reason that notice is given to the subscriber by a busy signal on the front of the telephone, so that he can tell at a glance whether or not the line is in use.

By the use of this system, it is claimed that it is possible for the exchange to offer a service practically equal to that of an individual metallic circuit. Each telephone is interchangeable and can be moved from one part of the line to another without adjustment. Another feature that will appeal to the telephone man is the low cost of the switchboard equipment and the utilizing of this system with switchboards and telephones already installed. The switchboard equipment consists of one automatic selector five inches in diameter, one ringing and listening key for the selector and but one extra ringing and listening key for each cord circuit, bringing the cost of the entire switchboard expense to less than $50 for each 100-section board.

Where telephones are now installed, it is possible to use selective lockout attachments mounted in handsomely finished round corner oak cases that are attached to the wall alongside the telephone now in use. The wiring for these devices is so simple that any telephone man can connect them up. Each telephone instrument has but four make-and-break contacts, the contact points being of pure platinum on German silver springs. The working parts are case-hardened steel, so that there can be no expense in the replacement of wearing parts.

M. B. Austin & Company have issued some very attractive printed matter, more fully describing the system. They have equipped a modern, up-to-date manufacturing plant with the newest and latest machinery throughout and are starting with a capacity ample to take care of a very large business. In the advertising space of this issue will be seen a cut of the complete telephone with self-contained selective lockout attachment.

NEW POST FOR E. J. PIETZCKER.

E. J. Pietzcker, who for two years past has been attached to the western sales department of the Standard Underground Cable Company of Pittsburg, with headquarters in Chicago, has been placed in charge of the company's new southwestern sales office in St. Louis, being located in the Security building. He is a capable man and will no doubt win fresh laurels in his new position. This move was made necessary because of the increasing business of the Standard company in the southwest and a desire to be in close proximity to this trade. Mr. Pietzcker's wide acquaintance in the west and southwest made him an especially desirable man for this position, and his experience and ability as a salesman is expected to still further add to the company's volume of business and prestige.

"JUST A FEW THOUSAND YEARS AGO."

A mailing folder with the above caption is being sent out by the Ewing-Merkle Electric Company, St. Louis. Its contents "point a moral and adorn a tale" and are herewith given:

"Three or four thousand years ago, approximately, someone in China built a house that was satisfactory to its tenants. This house had a good roof, good doors and windows, kept out burglars, rain and creditors, and let in sunshine and remittances from rich relatives. This was a satisfactory house; so satisfactory, indeed, that no other style of dwelling has been built by the Chinese up to this day. Caucasians are different folk, however. Once they have produced a good thing they never cease trying to better it.

"Just so it is with our electrical supplies. Every brand of goods we carry was made good in the beginning, has been improved every day since, and has kept five or six notches ahead of anything else, in similar lines, on the market. It is these points, Mr. Engineer, we want you to know, for it's your opinion, after all, that's the real authority. Each article is best where best is wanted. It is absolutely necessary to use high grade goods when the best is wanted, and as long as we supply you, whether your order be large or small, you can be assured that you will be getting supplies that are about six notches ahead of anything else that can be offered you. It pleases us to please you; that means money for both of us.

"Write us when you can; let us have your opinion on the quality of our stock, or better still, send us an order and let Everbest quality and methods speak for themselves. May we expect to hear from you shortly?"

GOVERNMENT BUYS STOMBAUGH ANCHORS.

W. N. Matthews & Brother, 505 Carlton building, St. Louis, report that Stombaugh guy anchors have been adopted for the following departments of the United States government: The United States Army, United States Navy, United States River Commission and United States Signal Corps. These different departments use the anchors for various purposes—the army for anchoring electric light and telephone poles, as at Ft. Riley, Kansas; the Navy for anchoring wireless telegraph masts in Florida, Porto Rico, Cuba and Panama; the River Commission for anchoring abatis on the Missouri and Mississippi rivers, and the Signal Corps for anchoring signal poles.

Judging from the above the United States government must be thoroughly satisfied with the work of the Stombaugh anchor and have entire confidence in its ability to hold any kind of a strain.

Their new catalogue is ready for the mail. It has the appropriate title, "Anchors That Hold."

BOUQUET FOR CHICAGO TELEPHONE SUPPLY COMPANY.

The South Bend (Ind.) Tribune in a recent issue paid the following high compliment to the Chicago Telephone Supply Company of Elkhart, Indiana:

"The success of the various Independent telephone exchanges in northern Indiana and southern Michigan is due in a large measure to the fact that they have in their midst one of the largest factories in the world devoted to the productions of telephones and switchboards. This factory is an important factor in the Independent telephone situation and has contributed largely to the success of the new enterprises.

"This factory is owned and operated by the Chicago Telephone Supply Company. It was originally an Illinois corporation, with factory and headquarters in Chicago. Owing to the enormous expense of manufacturing on a large scale, in a metropolitan city, the management decided, several years ago, to move the plant to a more desirable location. The present site in Elkhart was chosen, because, while it affords just as good facilities as Chicago for shipments to the far west or far east, at the same time, it is located in the heart of a district which probably contains more active telephone exchanges than any other similar district in the United States.

"The prosperity of the plant is attested by the 400 skilled mechanics whose combined efforts are constantly employed in producing 'the telephones that satisfy.' A visit to this factory is well worth the time of any telephone man, as in no other way can an adequate idea be formed of the vast amount of detail involved in the production of telephone apparatus.

"The most modern, special and automatic machinery is used throughout the factory, and it is astonishing what can be accomplished by such special and automatic machinery in a factory like that of the Chicago Telephone Supply Company, where the output is sufficient to warrant the expense of the equipment. Here are machines of such almost-human mechanism that one man can attend to seven of them at one time.

"These machines need no further attention than the insertion of rods of material, such as brass, iron or rubber, when the previous rod has been worked up. They operate with much more rapidity and uniformity than would be possible on the old type of hand machines. Other special machines drill and tap sixteen holes simultaneously, the holes being of different sizes and on different planes. These two types of machines illustrate the character of the special work, which must be performed.

"The system of inspection employed is the most rigid that can be imagined. Each sub-department has its special inspectors, who not only inspect each individual part for its electrical qualities, but also for its mechanical accuracy. In this way the finished product is always uniform.

"The Chicago Telephone Supply Company takes great pride in its business from southern Michigan and northern Indiana. Orders sent in by telephone in the morning are usually shipped the same afternoon, and thus exchanges are in closer touch with the source of supply than is possible when they order from Chicago or elsewhere. A switch to the factory door, connecting with all the railroads in Elkhart, affords a speedy means of delivering goods from the factories to the various carriers.

"While the Chicago Telephone Supply Company takes

great pride in its comparatively local business, it has customers scattered all over the United States, Canada, South America and Asia. It has state representatives in all of the principal states, and covers the entire country quite thoroughly.

"In issuing the latest catalogue a full carload of white paper was required and at one delivery six tons of catalogues were placed in the mails. Visitors are always welcome and the management takes pleasure in exhibiting the works of this model factory, either to users of telephones or to managers of exchanges.

CONTROLLAPHONE FOR MAGNETO EXCHANGES.

The Controller Company of America is putting out a controllaphone for magneto exchanges, as shown in the accompanying cut. In this instrument the necessity for a magneto generator is dispensed with. The user removes the receiver and drops the nickel, automatically throwing the magneto drop in the exchange and notifying central of the call. A connection cannot be called for unless the coin is first deposited. After taking the order if the connection desired and the telephone called for cannot be had for any reason the operator may, by pressing a button connected with a special cord, refund the coin to the party who deposited it.

NEW CONTROLLAPHONE.

This type of coin collecting apparatus fills a long-felt want in the small exchanges. In small towns there is the peculiarity that people who pay for telephones in their houses or stores on the flat rate plan, feel that they ought to be able to go to any telephone in town and make a call without being charged for it. And this is where the companies very often get into disagreeable controversies with subscribers who call from pay-stations at depots and drug stores for local connections. When the operator asks them to drop a nickel for the call they usually dispute her right to collect a nickel for the call and thus tie up the service on two lines, besides creating an unpleasantness between themselves and the company.

In the use of the Controller Company's No. 12 controllaphone this possibility of dispute is eliminated, because the party calling must first make up his mind whether his business is worth a nickel or not before he makes his call, because he cannot get the operator until he makes a deposit. If he makes a complaint after getting central the operator has the privilege of returning his nickel and refusing him the connection. There are few people, however, who would raise a dispute after having put their money in.

This form of telephone is being used by many of the companies in depots and other public places where there is a large element of transient service, for which the companies, as a rule, have received no compensation. The Controller Company of America is issuing a No. 12 bulletin fully describing this service, which may be had upon application.

DECISION FAVORS AMERICAN ELECTRIC FUSE COMPANY.

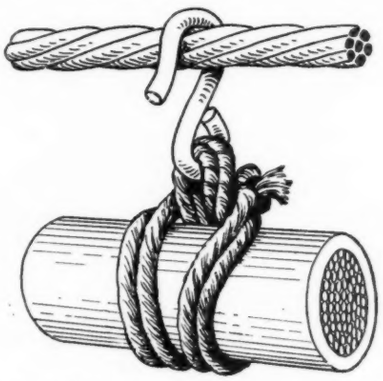
The American Electric Fuse Company, Chicago, is mailing to the trade a copy of the decision handed down by Judge Guy M. Chester in the Circuit court for the county of Lenawee, Michigan, in the case of the Rolfe Electric Company, a corporation, and Charles A. Rolfe, complainant, vs. the American Electric Fuse Company, a corporation, defendant. The suit involved the Rolfe pioneer self-soldering protector patents, and was decided in favor of the American Electric Fuse Company. In commenting upon the outcome of the suit the Fuse Company says:

"The decision confirms the American Electric Fuse Company's exclusive right to make all forms of self-soldering protectors, and makes all self-soldering protectors made by all other manufacturers, infringements on the American Electric Fuse Company patents. Since the suit was begun the American Electric Fuse Company has also acquired all of the patents of William Kaisling, which patents, combined with those of Charles A. Rolfe, completely cover all forms of self-soldering, self-repairing or self-restoring heat coil protectors."

NATIONAL MARLIN CABLE HANGERS.

The National Telephone Supply Company, 1432 Superior street, Cleveland, Ohio, is making a specialty of the manufacture of Marlin cable hangers in different grades and sizes, which are finding favor with the Independent telephone trade. The accompanying illustration shows the hanger made by this company in use. In a leaflet devoted to exploiting these hangers the company says:

"By reason of the large quantity of Marlin cable hangers we manufacture, we are able to furnish, and are to-day furnishing, the best and most durable hangers, at prices as low, if not lower, than our competitors are getting for inferior grades. We ask you to convince yourself by securing samples and comparing them with others. We guarantee our goods to be as we represent them in every particular."



NATIONAL MARLIN CABLE HANGER.

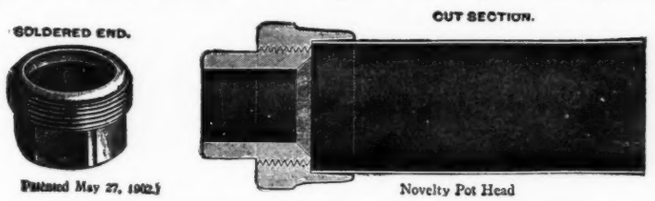
KUSEL CATALOGUE IS OUT.

The Kusel & Kusel Automatic Switchboard and Telephone Manufacturing Company, Chicago, is distributing its handsome loose-leaf bulletin catalogue, descriptive of the apparatus it handles. It is profusely illustrated and altogether a creditable piece of work. The company will

cheerfully send it to anyone making application. The Kusel company reports having closed contracts for automatic systems with the C. & N. W. Railway Company, Chicago, with companies at New Holstein and Kiel, Wisconsin, and the Eastern Wisconsin Telephone Company. The company states that there are quite a number of companies interested and expects to close some large contracts for its automatic apparatus before spring. The company is now distributing its catalogues describing this line of automatic apparatus, and will be glad to send endorsements, description and data to any company interested.

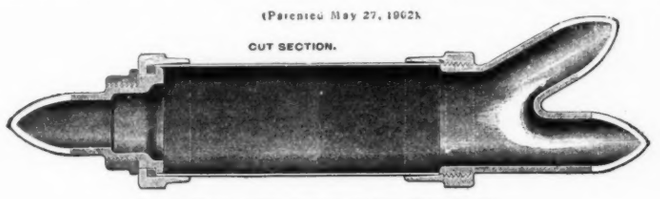
NOVELTY POTHEADS AND SLEEVES FOR LEAD ENCASED CABLES.

These unions are for telephone cables encased in lead, and when properly installed, the joints are mechanically strong, the insulation very high, and they are permanent against everything but mechanical injury. The joining of two pieces of lead pipe has always been a difficult and expensive task, because not everyone can wipe a lead joint,



and no other method has been known. The plumber is always high-priced and not always obtainable—sometimes not willing—nor is he always as successful in wiping joints on poles or in manholes as when engaged in his natural business.

The expert cablemen are not very plentiful and are absorbed by the big companies, who have kept them on their staffs at uniformly high wages to be in readiness for occasional high priced work. Now any man who can handle a soldering iron, and he need not be an expert at it, can take one of these mechanical devices and do the work in a permanent manner better and cheaper than his predecessor. The manner of connections is shown in the accompanying illustrations and in the printed directions. Simplicity is, as with everything, their strong point. They are easily and quickly installed, and it is, indeed, a poor workman who cannot



SLEEVE AND TWO-WAY BRANCH.

produce a permanent joint which is absolutely water tight. When properly made, they are guaranteed against water, even if continually submerged.

If an old style pothead or sleeve makes trouble, there is no way to inspect and repair it. It is sacrificed and a new one made, which costs a lot of money. With Novelty sleeves and potheads inspection is possible at any time without injury to, or waste of, cable and without expense. This ease of inspection is particularly valuable in case of two and three-way branches. These may be installed and opened up again and re-installed in places where wiped joints would hardly be possible, let alone inspected and repaired.

Potheads should be filled with Security cable compound, and if this is applied too thick and does not properly settle at the bottom and fill all the places, it may be melted again by applying the flame of a blow torch to the brass sleeve. This cannot be done with lead, and many potheads have made trouble because the compound was run in too cold and did not properly fill it all.

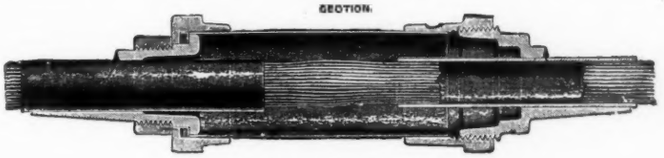
The use of red lead on the threaded joints is discouraged. Plumbago mixed with cylinder oil is furnished with every shipment, or can be easily obtained anywhere. It is better than red lead, because it is equally water tight, and it loosens if the joint is to be opened.

The old methods of making sleeves and potheads com-

SLEEVE AND THREE-WAY BRANCH.

fitted the cable sheath, making a square shoulder impospelled hammering down the lead in the big sleeve until it sible. These tubes are held in hubs cast with square shoulders which are slid close to the end of the lead sheath and so make possible shorter joints. Even if the cable to be joined is not expensive the ends may be short enough to just meet and in such event the few inches become very valuable. In emergencies a very long sleeve can be furnished to save making an extra joint.

Another interesting possibility is that two cables may be joined by a straight sleeve and later on this sleeve may be removed and a two or three-way branch substituted. Or, if the use of the branches can be predicted, the proper sleeve and branch joint may be installed at the start. The branch outlets will be furnished plugged at a very nominal



SLEEVE STRAIGHT AWAY.

price and will remain water-tight until wanted, and can then be easily opened with a soldering iron.

The entire tool equipment consists of a soldering iron and means to heat it and two wrenches, and no expensive platforms or scaffolding are necessary. Good work can be done in places, inaccessible to heavier outfits, and by any workman with the necessary skill to handle these very simple tools.

Security Potheads and Sleeves are manufactured by the F. Bissell Company at its Toledo factory, and it will, on request, ship samples of any of the standard sizes, subject to inspection, and, if not approved, they may be returned at manufacturer's expense. This applies to the entire line of Security specialties.

NEW YORK GROUND CLAMPS.

The Yonkers Specialty Company, Yonkers, New York, manufacturer of telephone specialties, reports the demand for its New York Ground Clamp so great that it is scarcely able to keep up with its orders. The increasing demand for this device, which is designed to connect a telephone ground wire to water pipe or another ground rod, is an indication of the desire on the part of the telephone superintendents to look after the small details of their construction work, and to affect the small economies, which in the aggregate mean increased earnings for the plant. The New York Ground Clamp is the mature product of several years of experimenting, and answers its purpose admirably.

Lundquist Automatic Trunking System

The real, live issue of the day in regard to telephone business is whether or not the automatic switchboard will take the place of the manual switchboard. As this subject is now universally discussed, it will undoubtedly be of interest to the telephone public to know as much about the automatic as possible and to become familiar with the circuits and mechanisms.

The Globe Automatic Telephone Company, pioneer in the automatic telephone business and owner of the basic patents covering the trunking system and other appliances necessary to automatic telephone apparatus, will furnish the telephone public detailed descriptions, diagrams and illustrations of its various automatic telephone devices. This article contains what might be termed the outlines and will be continued in future issues with description of complete circuits, etc. F. A. Lundquist, the inventor of this system, and the Globe company, manufacturers of the apparatus, may be considered the pioneers in the automatic field, as Mr. Lundquist's inventions date back several years and all of his patents are owned by the Globe Automatic Telephone Company. The company is also the owner of many other patents pertaining to automatic telephone apparatus.

The object of these articles is to make clear in the minds of those interested in telephone work the fact that the automatic is not the "system of complications," but the "system of simplicity" compared to manual systems.

The Lundquist system for automatic exchanges may be defined as a trunking and grouping system devised for the purpose of increasing the capacity of the exchange without increasing the size of the automatic switches used to operate it. The division of the switches into groups and the provision of trunk lines between the groups is the foundation upon which it rests. Another way of stating the thing would be to say that it is a trunking or transfer system made completely automatic by the introduction of automatic switching devices and the division of these devices into groups from which the trunk lines extend and to which suitable connections are returned.

In exchanges of this kind each subscriber's station is provided with a switch at the central office and commonly called a selector, though the inventor uses the term "main switch." In addition to these selectors or main switches there are a certain percentage of secondary switches commonly called connectors, but which the inventor designates as auxiliary switches.

In an early form of this system, as described in patent No. 747,197, issued December 15, 1903, the main switches were divided into groups of nine or ten, and for each group of main switches there was provided one auxiliary switch. When a subscriber at his station operated his main switch or selector he could extend his connections to any desired one of the auxiliary switches. Having selected a desired auxiliary switch he could then operate it so as to further extend the connections to any desired member of the group to which this selected auxiliary belonged.

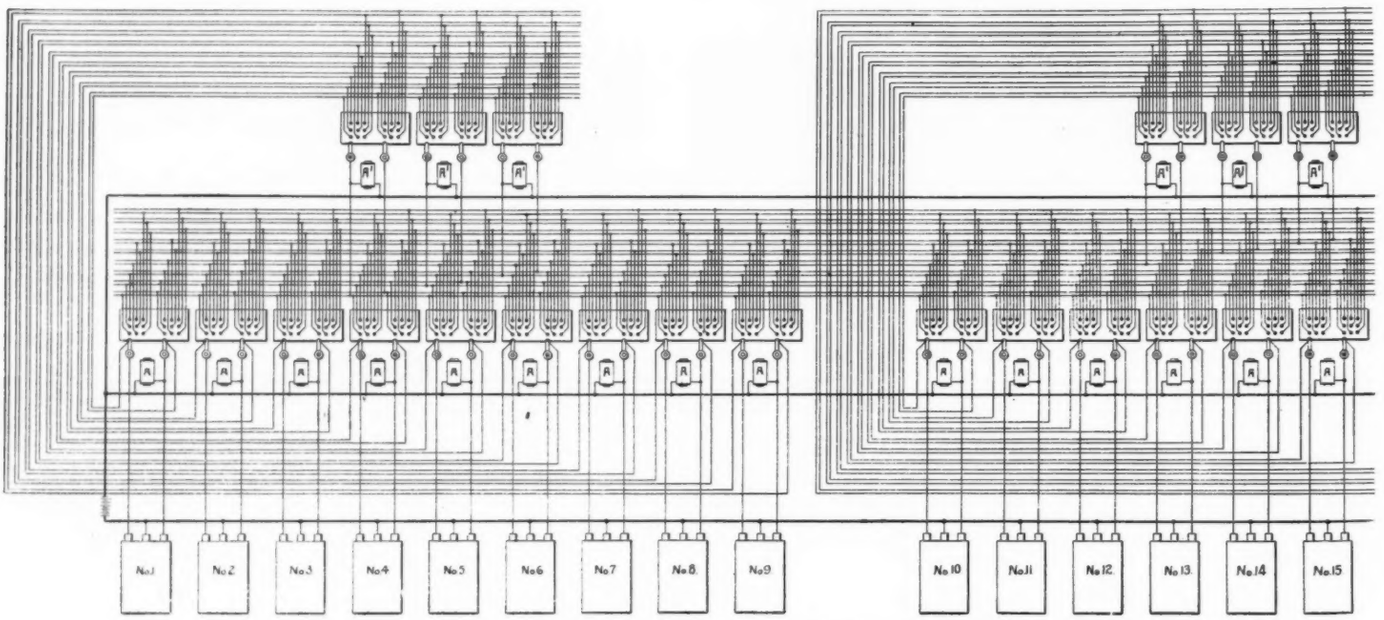


FIG. I. DIAGRAM OF LUNDQUIST SYSTEM.

A later and more developed form of the Lundquist system is illustrated in patent No. 776,524, issued December 6, 1904. The exchange in this case is shown as being of one thousand capacity. The one thousand main switches are divided into ten groups of one hundred each, and for each group of main switches there is a corresponding group of auxiliary switches. Each subscriber's line terminates at the central office in a pair of movable contacts or wipers, each pair being adapted to engage one hundred pairs of stationary contacts. These stationary contacts are arranged in ten rows of ten points each. In all main switches the first row of contact points represents the first group of auxiliary switches, the second row represents the second group, and so on.

To make these representations effective there are one hundred pairs of trunk lines adjacent to the entire series of main switches. The first pair of trunk lines has branches to the first pair of stationary contacts on each main switch so that when any main switch has its pair of movable contacts or wipers moved to connection with its first pair of stationary contacts, that switch is in connection with the

first trunk line. The second pair of trunk lines has branches to the second pair of stationary contacts on each main switch, by means of which anyone can reach connection to the second trunk line. This process is continued throughout the entire series of trunk lines.

Like the main switches, the auxiliary switches have each a pair of wipers adapted to engage one hundred pairs of contact points. These points are also arranged in ten rows of ten points each. The pair of wipers on the first auxiliary switch of the first group are the terminals of the first pair of trunk lines. By the same orderly arrangement the wipers of the other auxiliary switches are the terminals of the other trunk lines.

The one hundred pairs of contact points on the first group of auxiliary switches or connectors are connected together in multiple to a bank of one hundred pairs of wires, and these wires are connected back to normal contact points on the one hundred main switches or selectors of the first group. In the same way the ten auxiliary switches of the second group are connected in multiple to the wires which extend to the one hundred main switches of the second group of main switches. This is continued throughout the system, each group of auxiliary switches being connected in multiple to wires which terminate in the different members of the corresponding group of main switches.

It will be seen by this that grouping is a prominent feature of this system. The main switches are divided into groups, the auxiliary switches are divided into a similar number of smaller groups, and the connections from the auxiliary to main switches are also in groups so arranged as to maintain the distinctive grouping character. The only connection between the groups is through the trunk lines.

This system is illustrated in Fig. 1, which is taken from patent No. 776,524. In this diagram three instead of ten is taken as the basis. Thus, instead of there being ten rows with ten stationary contact points in each row, only three rows are shown with three contact points in each row. As a result of this there are only three auxiliary switches in a group, and only three times three, or nine, main switches in the corresponding group. The diagram shows one group complete and part of a second group. If extended to make a complete exchange on three for a basis there would be three complete groups.

In operating his calling device so as to connect to a desired station the subscriber first moves the wipers of his switch laterally to bring them under desired rows of stationary contact points. This is a preliminary selection of a desired group of contact points and one of the features of the system as set forth in the patent in question. Having selected a particular pair of rows of contact points he starts his wipers moving over these rows. If the first auxiliary switch of the corresponding group happens to be busy the wipers pass idly over the first pair of contacts to the second pair. If the second auxiliary switch is also busy the wipers pass over the second contacts to the third ones, and so on over all of the contacts representing auxiliary switches which are at the time employed.

As soon as the wipers of a moving main switch reach connection to a pair of contacts representing an idle auxiliary switch, a series of operations automatically take place, the effects of which are, first, the moving main switch is brought to a stop with its wipers on these contacts, and, second, the previously idle auxiliary switch is transferred to the busy class by being moved from its normal position and being left in electrical association with the selecting main switch. This is the automatic selection of an idle switch out of a previously selected group of switches.

Having secured possession of an auxiliary switch associated with a desired group of main switches, the subscriber, by manipulating his calling device, is then enabled to move this switch, first in one direction and then in a perpendicular direction, to connection with any member of the corresponding group of main switches. This gives him telephonic connection with the desired station.

This form of the Lundquist system differs from the earlier form principally in increasing the number of selectors in a group and providing a plurality of connectors in corresponding groups, any idle connector of a group being automatically selected for completing a talking circuit. The rearrangement of the stationary contacts is merely incidental to the carrying out of the system. The same relative number of selectors and connectors are used in both forms, but the later form has the advantage that it avoids the delays incident to the earlier form. In the case in which the subscriber's switches are divided into groups of ten with one auxiliary switch for each group, when a subscriber is called and is talking, no other subscriber in the same group can be called because the only auxiliary switch serving that group is busy and cannot be reached. This might readily occur even though every other auxiliary switch in the exchange were at the time idle. When there are several auxiliary switches serving a group of subscribers the groups may be made much larger, and experience has shown that ten auxiliaries to one hundred mains is a safe average for ordinary business. In very busy sections the requirements may be met either by decreasing the number of main switches in a group, or by increasing the number of auxiliaries apportioned to the group. In the latter case the length of the rows of stationary contacts is increased and a corresponding number of trunk lines is added.

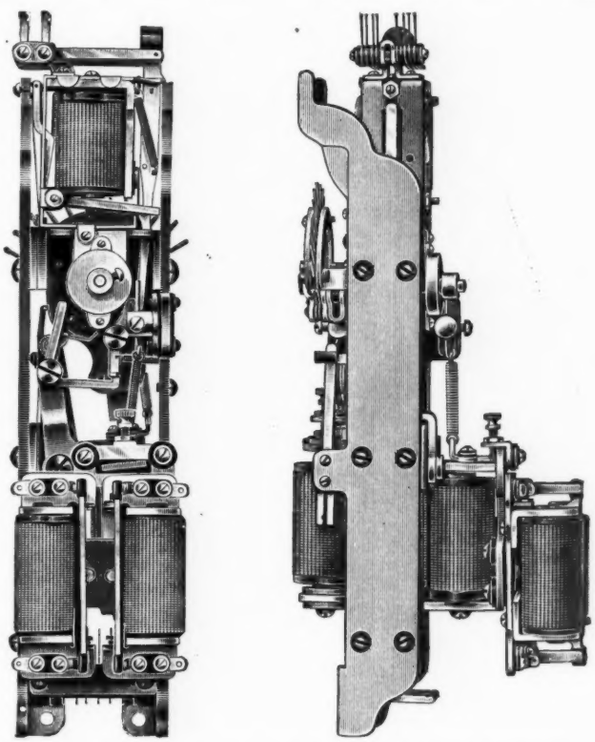


FIG. 2. FRONT ELEVATION OF GLOBE LINE SWITCH.
FIG. 3. SIDE ELEVATION OF GLOBE LINE SWITCH.

Although the patents which describe these two forms of the Lundquist system have only recently been issued, they go back several years for their filing dates in the patent office. The terms "main switch" and "auxiliary switch," used in the patents and in this description of them, were those used in the early history of the art and before the more modern terms of "selector" and "connector" were adopted. Since then the system has undergone further evolution and is now made in its perfected form by the Globe Automatic Telephone Company, 155 West Jackson boulevard, Chicago.

In the latest development of this system the old main

switches or selectors with their one hundred pairs of contact points are replaced by small line switches (Figs. 2, 3 and 4), each having thirteen pairs of contact points. These line switches are divided into groups of one hundred or less when occasion requires. For each group of line switches there is a group of eleven trunk switches. These trunk switches (Fig. 5) are very similar to the old auxiliary switches, and each has one hundred and ten pairs of stationary contacts. The two wipers on each of the eleven

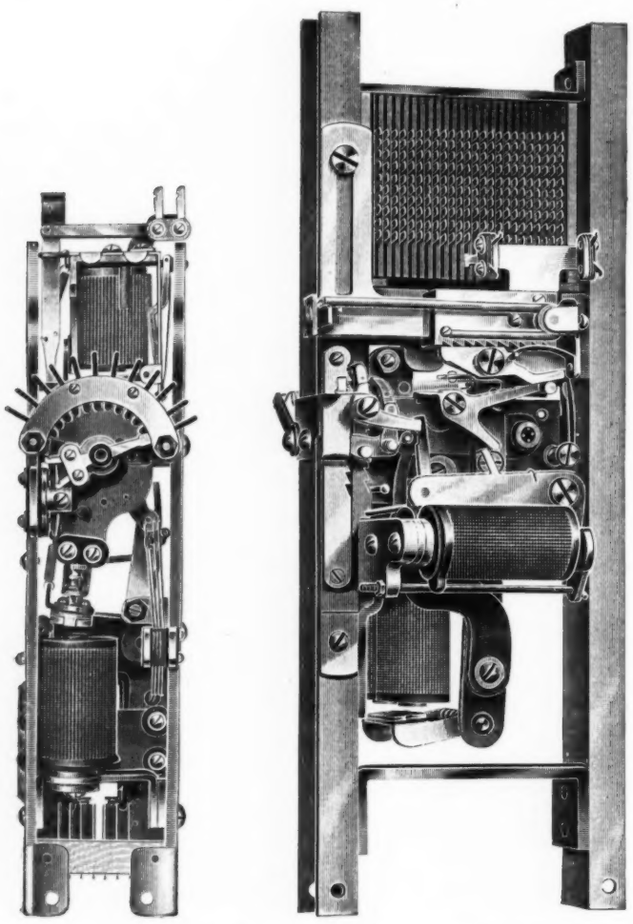


FIG. 4. REAR OF GLOBE LINE SWITCH.
FIG. 5. GLOBE TELEPHONE COMPANY'S TRUNK SWITCH.

trunk switches are terminals of eleven trunk lines which have branches to eleven of the thirteen pairs of stationary contacts on each of the line switches in the corresponding group. Of the other two pairs of contacts on each line switch, the first pair represents the normal contacts through which the switch is reached from some other switch, and the last pair represents a busy signal circuit which is automatically thrown onto the subscriber's line in case the line switch runs over all of its contacts without finding an idle trunk switch.

Ten groups of these trunk switches have their stationary contacts connected together in multiple by one hundred and ten pairs of trunk lines. These trunk lines terminate in the wipers of ten groups of final trunk switches, there being eleven in each group. These final trunk switches are in effect the same as the selectors or auxiliary switches in the older forms of the system. The pairs of stationary contacts of a group of these final trunk switches are connected in multiple to wires which extend to the normal contacts of line switches located in the corresponding group.

In this form of the system the functions performed by the old main switches are divided between an equal number of small line switches and a smaller number of trunk switches which are of the same size and capabilities as the old main switches.

In operation, when a subscriber removes his receiver he starts his line switch into automatic operation. When its wipers reach connection to contacts representing an idle trunk switch the line switch comes to a stop in electrical association with that trunk switch, and the trunk switch so selected is transferred to the busy class. In other words, as soon as the subscriber has removed his receiver and is ready to manipulate his calling device, he is in possession of an idle trunk switch and can operate that switch in the same manner and with the same results that he would operate his main switch or selector under the older form. In doing this he makes a preliminary selection of a desired group, and this selection automatically terminates in the automatic selection of an idle one of the final trunk switches in that group. He is then in a position in which by a further manipulation of his calling device he moves the final trunk switch first in one direction and then in a perpendicular direction to complete connections to the desired line switch in the corresponding group.

In cases in which the exchange is for more than one thousand capacity there is inserted between the primary or first trunk switches and the final trunk switches, a set of intermediate trunk switches corresponding in details to the primary trunk switches. When the exchange is for more than ten thousand subscribers there is inserted a second set of intermediate trunk switches.

The final switches differ from the trunk switches in that each has a third group of stationary contacts and carries a third wiper adapted to engage these contacts. The ten or eleven final switches of a group have the contacts of their third groups connected in multiple, and each switch carries a special circuit breaking magnet. These are so arranged that should two calls come for the same subscriber, the last one to make the connection would have his talking circuit broken and a busy signal thrown on his line. These final switches are the only ones upon which it is necessary to carry the third wiper. In all other places the non-interferences are taken care of through two wipers and their connections.

If a line switch does not find an idle trunk switch to which it can connect it comes to a stop on the busy signal. The same thing is true of the trunk switches and any intermediate trunk switches, but is not true of the final switches.

The line switches, as made by the Globe Company, are shown in Figs. 2 to 4, in which Fig. 2 is a front elevation, Fig. 3 is a side elevation and Fig. 4 is a rear elevation. The spools at the lower part of Fig. 2 are the relays which control the operating and release magnets, and the one at the top is the circuit breaking magnet which brings the switch to a stop when the wiper reaches connection to an idle trunk switch. The automatic operation of this switch is an interesting feature.

When the subscriber removes his receiver the hook makes a temporary contact, closing the circuit for the operating relay. This in turn closes the circuit for the operating magnet to cause a movement of the wiper. The operating magnet falls back it again closes the circuit for the relay, and through the relay its own circuit. This process of each alternately making and breaking the other's circuit is continued until the wiper reaches an idle trunk. When this occurs a circuit is completed temporarily through the magnet at the upper end of the switch. This permanently breaks the circuit for the operating magnet, thus bringing the switch to a stop in connection with the selected trunk.

The wipers for this switch consist of insulated arms mounted upon a spindle and rotated by a ratchet wheel. The stationary contacts are arranged in the arc of a circle, as shown in the rear view, Fig. 4.

These line switches are two and one-half inches wide by ten and one-half inches high. They are arranged in sections of twenty-five switches in each section, and these sections are mounted in steel frames. Fig. 7 shows one of these sections. They are so arranged that the mere act of placing a switch in its section completes all of the necessary electrical connections. As a result of this any switch may be removed and a new one put in its place without the necessity of making new electrical connections.

In arranging an exchange a normal group of line switches consists of four of these sections. If any portion of the exchange has more calls than can readily be cared for by eleven final trunk switches, then a group may consist of three or even two sections. In such a case the number of line switches in a group is reduced to seventy-five or fifty, as the circumstances may require.

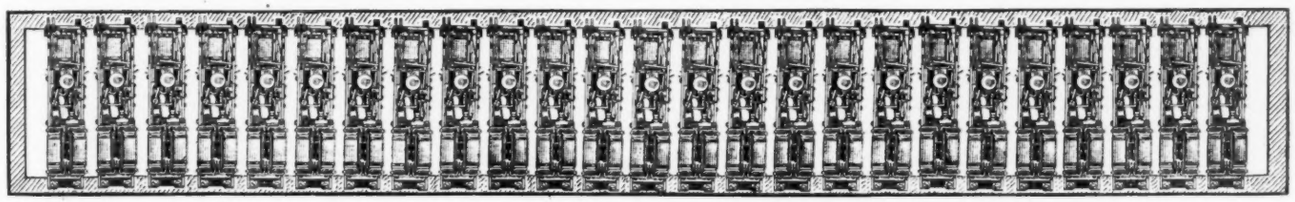


FIG. 7. SECTION OF TWENTY-FIVE LINE SWITCHES.

The trunk switches, shown in Fig. 5, have their stationary contacts in a rectangular arrangement. The transverse movement is made by an operating magnet and its length depends upon the number of contacts made by the subscriber at his calling device. This transverse movement is the first conscious operation performed by the subscriber.

Upon the completion of this transverse movement the calling device sends an impulse through the operating relay of the trunk switch. This starts the wipers upward on the selected row of contacts, the movement being automatic on the same principle described for the line switch. This automatic upward movement is completed and an idle final trunk switch is picked up before the subscriber can make the second part of his calling operation. The maximum time required for this automatic upward movement is a small fraction over one second. Ordinarily the time is less than one second because an idle switch is usually found before all of the possible connections are made.

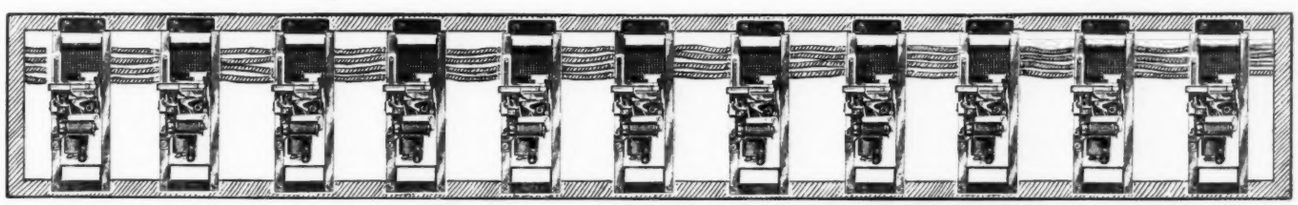


FIG. 8. SECTION OF ELEVEN TRUNK SWITCHES.

The Globe Company's trunk switch, as illustrated in Fig. 5, is three and one-half inches wide and eleven inches high. Eleven of these trunk switches are arranged in a section, as shown in Fig. 8, and a section forms a complete group in the exchange. These sections are mounted in steel frames, a frame being made to hold from one to five sections, according to the size of the exchange or the conveniences of the arrangements. As in the case of the line switches, the necessary electrical connections for the trunk switches are made by securing them in place in their sections.

The same general description which applies to the trunk switches also applies to the final switches. Besides the additions of a third group of contacts, a wiper for these contacts, and the circuit breaking magnet before referred to for preventing interfering connections, they also carry the devices for ringing. The final switches are arranged in sections of eleven and these sections are mounted in steel frames as in the case of the trunk switches.

The style of telephone and calling device is shown in Fig. 6. The principal novel and interesting thing about this is the calling device itself. This is provided with a pointer which is moved successively to numbers on a dial and permitted to return to its normal position after each movement. Thus, in calling telephone No. 345, the pointer is moved to "3" and released, then to "4" and released, and then to "5" and released. Pressing the adjacent button to ring completes the call for the desired telephone.

The handle which the subscriber takes hold of, and the pointer which indicates the number on the dial, are on two separate arms. When the handle is moved forward from its normal position, as shown in Fig. 6, the pointer travels with it, but during the backward movement of the handle the pointer stands still on the number indicated. As soon as the handle strikes its normal or home position the pointer is released and runs back to its normal position in connection with the handle. The next forward movement of the handle again advances the pointer as before.

There are several important things accomplished by this arrangement. The handle may be released, in which event it flies back instantly to its normal position, or it may be moved back by hand. In either case the pointer stands for a period of time on the number selected, thus giving the subscriber ample opportunity to observe the correctness of that part of his call. In case the handle is retained in the hand, no movement of the handle between its normal position and the pointer will in any way affect the call. He may vibrate it back and forth as much as he pleases without affecting the accuracy of the call. This obviates errors likely to occur when the calling device is operated by a nervous person or one not familiar with such devices. In practice the subscriber moves the pointer to the desired number and then, before releasing it, permits it to fall back a short distance. This instant between the final part of the forward movement and the actual release gives him opportunity to observe the accuracy of the indication. In case he does not release the handle but holds fast to it until it has reached its home position and then attempts to move it forward again before the pointer is also back to its home position, he finds the handle locked so that he cannot move it forward.

The safety features of this calling device may be stated a little more clearly as follows: The pointer which indicates the number to be called is moved forward to the desired position by the handle, but cannot return to its normal position until the handle has preceded it to that position. As soon as the handle reaches its normal position it releases the pointer which immediately follows it. In other

words, the handle and pointer move forward together but move backward separately. During the backward movement of either the other is locked in a stationary position.

The backward movement of the pointer is actuated by a spring and its speed is controlled by a governor. As the contacts which operate the central office switching mechanisms are made during this backward movement the speed of the movement may be regulated so as to take the least time consistent with accurate operation.

To return to the general operation of the exchange, the subscriber removes his receiver and pulls the handle of his calling device down until the pointer indicates the first figure of the number he wishes to call. He then releases the handle and permits it and the pointer to return to normal. This is quickly done, but in the doing there is a certain amount of idle time which is taken advantage of for automatic operations. The rising of the receiver hook makes a contact which starts the line switch into automatic operation, and between that instant and the time when the backward movement of the pointer starts a series of contacts, the line switch has secured possession of an idle trunk switch.

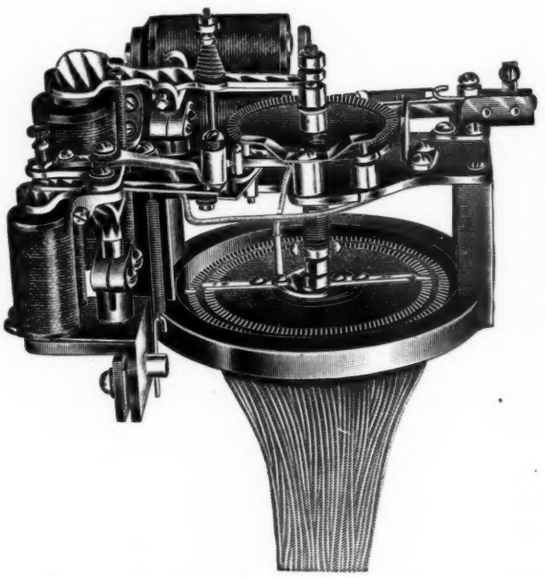
During the backward movement of the pointer the contacts made cause the lateral movement of the trunk switch, and just when the pointer in reaching its home position releases the handle it makes a contact which starts the

FIG. 6. GLOBE AUTOMATIC TELEPHONE.

trunk switch on its automatic movement over the selected row of contacts. During the interval of time in which the subscriber is moving the handle forward the second time to indicate the second figure of the number to be called, this upward movement of the trunk switch is completed and the subscriber is in possession of an idle one of the final switches.

It will be seen from this that the subscriber can operate his calling device so that within two seconds from the removal of his receiver he can have the second series of contacts in operation. Yet before this second series begins to act his connections have been extended from his line switch to an idle one of eleven trunk switches, the trunk switch picked out from its group has been shifted to any one of a numerous series of groups of other switches, and an idle member of this group has been automatically picked out so that the second series of contacts determines the movement of the third switch from the beginning.

The rapidity with which the operation of successive devices follows each other in any direction through the system of switches and electrical connections is truly remarkable. That the Lundquist system can accomplish such results shows that it is one of great capabilities and possibilities. The mechanism throughout the system is composed of comparatively simple devices which are constructed in such



100 LINE SWITCH FOR SUB-EXCHANGES, COUNTRY LINES, ETC.

a manner as to make them durable and capable of withstanding the wear of continuous use.

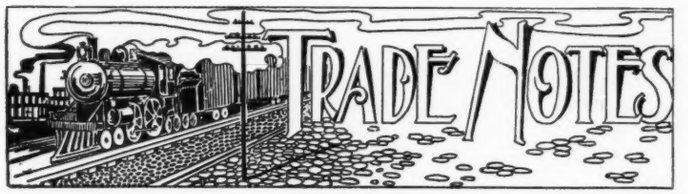
In addition to the trunking system, which patents are all controlled by the Globe Automatic Telephone Company, it manufactures its regular 100-capacity switches and telephones for small exchanges and country lines, together with the devices for operating sub-exchanges automatically. In fact, the Globe Automatic Telephone Company is now in position to furnish apparatus for any and all conditions.

WIRELESS TELEPHONE EXHIBIT.

At a recent exhibition in Pittsburg an interesting demonstration of wireless telephoning mystified a great many people until it was explained. The apparatus consisted of a sort of metal crown from which depended two wires, ending in the ordinary receivers. The experimenter placed the crown on his head, adjusted the receivers to his ears, and immediately the music of Damrosch's orchestra, playing in a building in a distant part of the grounds, could be heard.

The volume of sound was small apparently, but the music was distinctly audible. As the crown had no connections and could be handed about and examined, everyone was at a loss to understand how the sound currents could be caught until it was explained. In the top of the booth in which the contrivance was exhibited was an immense coil of wire, connected with the building in which the orchestra was playing. Directly over the orchestra was an enormous transmitter. In the crown was another coil of wire, and by standing under a large coil in the booth a current was engendered between the two coils and the sound was transmitted, faintly, but clearly.

The apparatus was a novel one, and demonstrated that wireless telephony is possible, although perhaps not yet in shape for general use.



THE GREEN TELEPHONE AND ELECTRIC MANUFACTURING COMPANY, Milwaukee, Wis., installed the hotel telephone system recently put into the Cook House at Rochester, Minn.

THE DEARBORN ELECTRIC COMPANY, 122 West Jackson boulevard, Chicago, has now on the press a complete telephone catalogue, which it will be pleased to send to all interested parties.

THE MONARCH ELECTRIC WIRE AND MANUFACTURING COMPANY, 125 South Clinton street, Chicago, has issued a complete catalogue of its telephone and electrical goods, which will be sent upon request.

THE NATIONAL BATTERY COMPANY, Buffalo, New York, is sending out a neat illustrated catalogue descriptive of its electrical vehicle batteries, copies of which may be had by anyone interested upon application.

THE NAGEL-COLLINS MANUFACTURING COMPANY, Chicago, electrical and mechanical specialties, expresses its "compliments of the season" through the medium of a very neat calendar, which it is sending out to the trade.

THE NORTH ELECTRIC COMPANY, Cleveland, is sending out by mail its Bulletin No. 26, relative to switching stations for small or isolated exchanges, and auxiliary card equipments. It should be in the hands of all those interested in installations of this sort.

THE EDISON TELEPHONE COMPANY, 6614 State street, Chicago, is making a very attractive special offer on its five-bar, 1,600-ohm bridging telephone. Parties interested should write to the Edison Telephone Company for its printed matter and special offer.

THE NATIONAL WIRE CORPORATION, New York city, is putting out an illustrated folder bearing on the superior quality of its extra double galvanized wire for telephone and telegraph lines. It invites interested parties to "Tell us what work you have to do, and we will tell you the best size and grade to use."

THE WESCO SUPPLY COMPANY, St. Louis, is mailing to the trade Bulletins Nos. 61 and 62, describing the well-known product of its telephone factory, including switchboards, operators' desks, telephones and telephone supplies. These bulletins are illustrated, attractive, and may be had upon application.

THE APPLETON ELECTRIC COMPANY, 224 Washington street, Chicago, has just issued a new catalogue of electric lighting and telephone supplies. Since the Appleton Company was organized, something over a year ago, it has made rapid progress, and to-day its goods are pronounced equal in every respect to any on the market.

THE "Equipoise" Telephone Holder is an entirely new type of holder, which is now being introduced to the trade by the Oliver Manufacturing Company, 1006 Drexel building, Philadelphia. The "Equipose" consists of a double arm revolving on a pivot attached to desk, table or wall; one of the arms carries a spiral spring which counterbalances the weight of the telephone in the movement of the arm from vertical to horizontal position, the telephone remaining at rest at any desired point. Descriptive literature and prices may be had on application.

THE CHICAGO TELEPHONE SUPPLY COMPANY, Elkhart, Indiana, has just closed a contract with the Home Telephone Company of Goshen, Indiana, for a 2,000-line visual signal switchboard, with lamp supervision, also chief operator's desk, toll desk, and distributing and lighting arrester board, with self-soldering heat coils.

THE HERMAN ANDRAE ELECTRICAL COMPANY, Milwaukee, with a capital of $10,000, was recently incorporated to take over the construction work of the Julius Andrae & Sons Company, which, however, will continue in the electrical supply business. The incorporators are Herman Andrae, Herman Schmidt and Jacob Tellier.

THE AMERICAN ELECTRIC TELEPHONE COMPANY, Chicago, has recently issued a series of bulletins, descriptive of its entire line of apparatus and supplies, which can be had separately, if interested parties will kindly specify their especial needs; or the entire series will be sent, bound, with a cover, and forming a comprehensive and finely illustrated catalogue.

THE MINNEAPOLIS CEDAR AND LUMBER COMPANY, Minneapolis, has purchased a new yard on the Kelliher branch of the M. & I. railroad in northern Minnesota, which gives it nine yards and puts it in first-class shape for prompt shipments of both large and small orders. It is putting in a large stock of poles and in the future will make the pole trade a specialty.

THE STROMBERG-CARLSON TELEPHONE MANUFACTURING COMPANY, Rochester, New York, and Chicago, reports that it is just completing for the United States Telephone Company, for use at Toledo, Ohio, one of the finest toll boards it has ever turned out. The board consists of five sections of three operators' positions each. The board is equipped throughout with the most modern apparatus.

THE WESTERN ELECTRICAL COMPANY, Omaha, Nebraska, has made arrangements with the Chicago Telephone Supply Company of Elkhart, Indiana, to handle its well-known product in Nebraska, which with the Supply company's representatives already in that field, will make Chicago telephones better known than ever in that section of the country, and is sure to prove profitable to all concerned.

THE STANDARD TELEPHONE AND ELECTRIC COMPANY, Milwaukee, is responsible for something new in the way of a telephone catalogue. Instead of being printed in book form, it is a single sheet about five by three feet, and contains illustrations of the complete line of telephones and telephone supplies carried by the Standard Company. The catalogue is well gotten up and is sure to prove of interest to telephone managers. A request will bring one.

THE MILLER ANCHOR COMPANY, Norwalk, Ohio, reports that it has met with such large sales the past year that in order to keep up with the demand for its goods it is forced to enlarge its plant and double its capital, as it expects to do three times the business the coming season that it did last. Miller anchors are giving such good satisfaction, the company states, that those that have tried them become steady customers. Their trade has been very heavy this winter on anchors going to the southern states, and also in filling large orders from the government for the DeForest wireless telegraph stations. The company places a strong

guarantee on its goods, and the anchors are said to fill the bill to the very letter. The company is booking orders now for future delivery, as companies find they must place their orders early to get the goods. It is also making every effort to accumulate stock for spring and will endeavor to fill all orders promptly.

THE FARR TELEPHONE & CONSTRUCTION SUPPLY COMPANY, Chicago, will increase its capital stock to $25,000, the steady growth of the firm's business making such a step advisable. The Farr company manufactures everything in the telephone line—from the smallest part to complete exchanges—and the excellence of its products has given it an enviable reputation. The untiring efforts of C. W. Farr, president, have placed the company where it is to-day.

MATTHIAS KLEIN & SONS, 87-89 Van Buren Street, Chicago, have issued a caution calling attention to the fact that all their linemen's tools, climbers, etc., are stamped with the firm name, "M. Klein & Sons." They say: "There are tools on the market stamped 'Klein's Pattern,' and a number of climbers have been sent to us in a defective condition which we have been asked to replace. Evidently the owners were under the impression that they were made by us."

THE INTERNATIONAL TELEPHONE MANUFACTURING COMPANY, Chicago, it is reported, has recently discovered that from a very hard coal, secured from Southern Brazil and granulated under a special treatment, it can produce a granular carbon which will give a transmitter a much louder and far more natural and distinct tone, and also enable using more battery for long-distance work or central energy systems, without causing a "frying" or "packing" of the carbon.

THE KAISLING protector, manufactured by the American Electric Fuse Company, Chicago, is the subject of a very attractive book just issued from the press. The publication contains profuse illustrations and descriptions of the Kaisling apparatus, and typographically is a most artistic catalogue. The American Electric Fuse Company is an aggressive, hard-working and persistent seeker for business, and during 1905 it expects to increase very largely its protector business.

THE BELDEN MANUFACTURING COMPANY, Chicago, owing to increasing business and a demand for more room, has removed to 192-194 Michigan street, where it now has its machinery installed and is turning out large quantities of magnet and telephone switchboard wire, etc. It is better prepared than ever to handle and fill large orders promptly and accurately. The company's new quarters are commodious and its manufacturing facilities all that could be desired.

THE CENTURY CONSTRUCTION TELEPHONE COMPANY, Buffalo, New York, owing to the large increase of its western business, is contemplating the opening of a branch office at Kansas City, to better enable it to make quicker shipments to its customers in that territory, although at the present time it delivers goods to points in Kansas and Missouri in from four to eight days from the date of receipt of order. Its western representative at the present time is Lloyd E. Knapp, who is located at Kansas City, and who has worked up a fine trade in that territory for the Century company. A handsome new catalogue is just issuing from the Buffalo office of the company, a copy of which it will be pleased to forward to anyone upon request. It explains fully the Century's new automatic signaling instrument for use on magneto systems, which employs a kick coil instead of a generator, and which will throw a switchboard drop through a resistance of 20,000 ohms. Other new apparatus of the company also is shown in detail.

THE Moon Junction and Splicing Box, which was briefly described in the February number of TELEPHONY, is more fully set forth in a mailing folder which the Moon Manufacturing Company of Chicago is now issuing. The subject of this folder has developed considerable interest among telephone men, and the Moon Manufacturing Company desires to state that it will be pleased to answer all correspondence relative to this new apparatus. It is prepared to ship promptly any size and for any combination of cable.

THE PEIRCE SPECIALTY COMPANY, Chicago, chartered under the laws of the state of Illinois, has taken over the electrical construction material business of C. L. Peirce, Jr. This is the result of the very remarkable growth of the latter's business, and the exceedingly bright prospects for future increase. The officers of the new company are as follows: C. L. Peirce, Jr., president; H. H. Titsworth, secretary; R. A. Peet, treasurer; C. M. Crapo, general manager. The company has moved into larger quarters at 105-107 South Jefferson street, where it will carry a complete stock for the prompt filling of orders of any magnitude. Correspondence is solicited.

THE GENERAL INSULATE AND MACHINE COMPANY, Brooklyn, New York, has recently been organized with a capital of $50,000 for the purpose of manufacturing high grade electrical insulations and hard rubber substitute. Among its principal products will be telephone receiver cases, mouthpieces, switchboard insulations and other telephone appliances. Joseph Steinberger, who is well known among telephone manufacturers, is the president of the new concern and L. Swanson, an expert engineer and machinist, is its secretary and treasurer, and will have charge of the manufacturing department. The products of this new concern in telephone appliances will include some valuable new features that will readily appeal to telephone and switchboard manufacturers. We are told that only the highest quality of work will be produced. The factory has been equipped with the newest type machinery and the firm has its own machine shop for the manufacture of the steel moulds required for its process. It is located at 1008 to 1014 Atlantic Avenue, Brooklyn, in a two-story building which it occupies alone.

ALTHOUGH Frank B. Cook's No. 8 protector has barely been announced, he states he has received a great many orders, and is also in receipt of communications from numerous engineers, manufacturers and operating companies, asking for samples of the new No. 8. The Automatic Electric Company gave Cook an order for the complete equipment of the exchange of the Citizens' Telephone Company, at Columbus, Ohio, the order being for 8,000 pairs of the No. 8. The original order was for No. 444 protectors, but the engineers, after examining the rough model of the No. 8, changed the order in favor of the latter. Other orders for the No. 8 are as follows: Twin City Telephone Company, Minneapolis, Minn., 300 pairs; Dean Electric Company, for the Poughkeepsie (N. Y.) exchange, 1,000 pairs; Kellogg Switchboard & Supply Company, for the B.-B. Telephone Company, Hutchinson, Kan., 1,120 pairs; Kellogg Switchboard & Supply Company, for the Red Wing Telephone Company, Red Wing, Minn., 900 pairs; Stromberg-Carlson Telephone Manufacturing Company, 1,660 pairs, which includes orders for the Commercial Telephone Company, Warsaw, Ind., 600 pairs; addition to the Twin City Telephone Company, St. Paul, Minn., 860 pairs; Seward County Telephone Companay, Seward, Neb., 200 pairs.

IN THE RURAL LINE DISTRICTS

A man without a telephone these days is only to be found in a graveyard. He is a dead 'un.—*Hume (Mo.) Telephone.*

The ladies at the switchboard say they believe the use of profanity is on the increase, so many people insist on talking "Helloish" to them.—*Sterling (Neb.) Record.*

The 'phones were put in on the new line last week. There is plenty of business just now. Everybody is saying hello.—*Webster Whispers in Fremont (Neb.) Tribune.*

The telephone here is a great convenience. People can sit by the stove and call up their neighbors to find out how the weather is outside.—*Sandusky Simmerings in Reedsburg (Wis.) Times.*

The Leaf River and Egan Mutual Telephone Co. are putting in new 'phones nearly every day. Fall in line, my brother, you will never regret it.—*Leaf River Lights in Mt. Morris (Ill.) Index.*

The telephone bells are ringing in Poplar. Cal Wetherell has the end on the line at Poplar Center. Cal has had many congratulatory calls from down the line.—*Poplar Pointers in Pine River (Minn.) Blaze.*

The telephone poles are all here and most of them are set. Some of them are in the shape of a bow, but we are told that they will hold up the wire better.—*Pohocco Paragraphs in Fremont (Neb.) Tribune.*

Some of the patrons of the telephone company here make the central girl earn her money by calling her up at 4 a. m. and then informing their neighbors that it is time to arise.—*Hansen Hints in Hastings (Neb.) Tribune.*

C. E. Brown and W. H. McPherson of the Brownstown Telephone Co. were over last week and repaired the 'phones on this line and now we hear with one ear quite well.—*Pleasant Grove Gatherings in Brownstown (Ind.) Banner.*

Chris Madsen returned to his home near Dannebrog Monday. He was one of the telephone constructionists and is a wholesouled fellow. The "boys" would like to see Chris remain all winter.—*Elba Echoes in St. Paul (Neb.) Republican.*

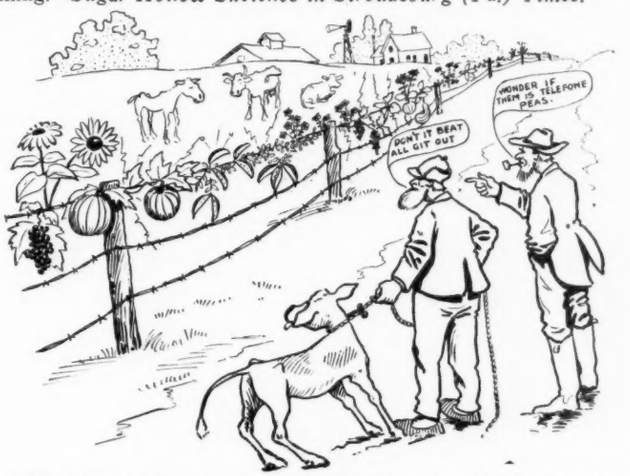
That new telephone company is shaping up. The latest improvement is an attachment that enables it to sing Old Hundred in five different keys at the same time. Get in on the ground floor.—*Mineral Murmurs in Princeton (Ill.) Republican.*

Over at Sheridan, according to the *Sentinel*, the patrons of the Northern Illinois 'phone made up a purse of nine dollars and presented the hello girl, Miss Maude Branen. Not only that, but she was given a cord of wood, five pounds of butter and, but this is sweet, four pounds of candy. Her liquid voice will now be more honeyed than ever. It was all in appreciation of the good service received by the patrons. She is not the only girl that might be remembered wisely by patrons in other towns.—*Seneca (Ill.) Record.*

The telephone line in this vicinity is in such bad shape that if Moses and St. Paul should try to talk to each other over it they would both forget their sanctity and use cuss words. The other night Ernest Wolfe called up a neighbor and when he took the

receiver down he sprang back in affright, upsetting the rocking chair. "Great Scott!" he exclaimed, "I thought the Old Nick had answered me. Don't you hear that sulphurous roar? It sounds like Dante's Inferno."—*Mt. Morris (Ill.) Index.*

The S. H. telephone line is bearing good fruits and is still blossoming.—*Sugar Hollow Sketches in Stroudsburg (Pa.) Times.*



[The above item was sent in by E. R. Gearhart of Saylorsburg, Pennsylvania, who refers to it as "declaring the success and indicating the future growth of a rural fence wire telephone line here."]

P. H. Johnson and E. W. Barnes, two telephone "tinkers," were tinkering with the line between here and St. Paul Wednesday. For full particulars of work done go ask Johnson, but we advise having a loaded gun when you put the question.—*Ella Etchings in St. Paul (Neb.) Republican.*

The Goshen man who invented a device to detect and cut off eavesdropping on a telephone line has the thanks of all legitimate users of the telephone. If generally adopted it will make telephone "small talk" as safe as kissing the hired girl behind the kitchen door.—*Rochester (Ind.) Republican.*

In a speech made by a Farmers' Mutual Telephone member recently the following remarks were noted by ye scribe: The time is not far off when every house will have a telephone, when the farmers' telephone system will spread all over the universe; for it is too good a way of doing business.—*Ultimathule Undulations in Lancaster (Mo.) Republican.*

We have made a division of the Beechwood telephone line, making two separate lines. Now we shall welcome some of our old friends and neighbors into our circle. As the poet says:

That telephone, that telephone, is such an awful bore,
In fact, I've listened o'er it 'till both my ears are sore.

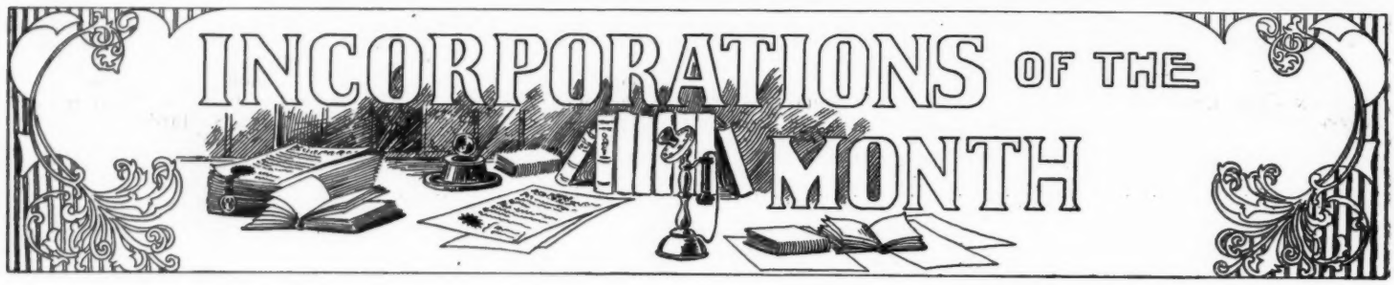
—*Beechwood Breezes in English (Ind.) News.*

J. L. Briggs and others sent his regular annual donation to the "central" operator at this place. This year it was in the form of a pig tail, something less than two feet long, with several nice ribs attached. Thanks, John, and may you live to enjoy many happy annual killings, may your shoats ever be the slickest, their hams the best and their tails the longest.—*Hepburn Handouts in Clarinda (Iowa) Journal.*

The Harris Telephone Company got swell and bought them an auto so as to look after the business of the line with dispatch. The maiden trip was taken Friday last. They 'phoned to Glenwood to look out for the devil wagon in thirty minutes, but instead at sundown they were seen to be stroking its mechanical intestines some miles away. The auto can be had at a bargain.—*Glenwood Grist in Burlington (Kan.) Jeffersonian.*

The telephone crew had a novel experience with their team last Saturday morning. Both horses balked in the street and kept balking for nearly two hours. Different remedies to make them move were used, also a fire built near them, partly to make them move and partly to warm up the cold air. We think they finally started, as the writer has not seen them at their old stand for a couple of days.—*Ogdensburg Offerings in Waupaca (Wis.) Post.*

The wonderful power of imagination! A party who is getting up a telephone line in Berryville met at the north end to continue the work. Some imaginative mind imagined that they were being imposed on by some one, and the result was that some of them worked their imagination up till they were as hot as a lime kiln, and as the subject of their imagination was not there the talk went on without let or hindrance.—*Lone Oak Letter in Olney (Ill.) Advocate.*



ARKANSAS.

YELLVILLE—The Yellville Telephone Company. Capital stock, $150,000. Incorporators, V. H. Weart, L. M. Weart, S. L. Brooksher, R. R. Brooksher, G. A. Ward.

GHENT—Caddo Cove Telephone Company. Capital stock, $20,000. President, J. Johnson; vice-president, J. L. Thomas; secretary, T. J. Hughes; treasurer, C. A. Driggars.

CANADA.

SCARBORO, ONT.—Scarboro Telephone Company, Ltd. Capital stock, $40,000. Directors, Alexander Neilson, John Neilson, David Brown of Scarboro; Thomas Albert Young of Markham; William Mulock, Jr.

MARKHAM, ONT.—The Markham and Pickering Telephone Company. Capital stock, $40,000. Directors, Alpheus Hoover, William Hoover, Donald Robert Beaton and William Alpheus Fuller of Pickering, Albert Christian Ressor of Markham.

CALIFORNIA.

OXNARD—The Oxnard Home Telephone Company. Capital stock, $75,000. Directors, C. F. Guthridge, C. L. Zahn, D. F. Bryce, C. P. Platt and A. Wright, all of Los Angeles.

LOS ANGELES—The Santa Clara Valley Home Telephone Company. Capital stock, $75,000. Directors, C. F. Guthridge, C. L. Zahn, D. F. Boyee, C. P. Platt, A. Wright, all of Los Angeles.

COLORADO.

BURLINGTON—The Burlington Telephone Company. Capital stock, $1,000. Incorporators, D Carnahan, C. D. Gillette, Wyatt Boger.

ILLINOIS.

CORNELL—Cornell Telephone Company. Capital stock, $9,000. Incorporators, H. W. Smith, J. Blue, E. A. Partridge.

PAWNEE—Sangamon County Telephone Company. Capital stock, $20,000. Incorporators, H. E. Farnam, E. L. Farnam, H. M. Farnam.

KIRKSVILLE—Kirksville Mutual Telephone Company. Capital stock, $2,400. Incorporators, O. M. Hale, E. R. Boggs, T. J. Williams.

LEXINGTON—The Prairie Hall Telephone Company. Capital stock, $3,800. Incorporators, G. K. Elder, John A. Moon, George C. Elder.

INDIANA.

TIPTON—Sand Bank Telephone Company. Capital stock, $1,000. Incorporators, J. M. Hoover, H. C. Haskett, G. A. Dickey.

ELLSWORTH—The Otter Creek Telephone Company. Capital stock, $1,200. Incorporators, G. L. Stevens, W. F. Carty and others.

SEYMOUR—Farmers' Mutual Telephone Company. Capital stock, $2,000. Incorporators, John M. Lewis, W. H. Bowman, John Q. Foster.

IOWA.

KENDALVILLE—The Harmony and Kendalville Farmers' Telephone Company. Capital stock, $600. Incorporators, Emmet Benson and others.

SHELDON—The Sheldon Telephone Company. Capital stock, $1,500. Incorporators, G. A. Starrett and others.

SCRANTON—Scranton Independent Mutual Telephone Company. Capital stock, $5,000. Incorporators, R. S. Lower and others.

SOLON—The Solon Telephone Company. Capital stock, $900. President, J. F. Potter; vice-president, M. T. Loder; secretary, J. J. Fiala; treasurer, George Ulch; manager, M. A. Randal.

KANSAS.

PAWNEE ROCK—A local telephone service will be installed as soon as the material can be secured. The directors of the company are Charles Gano, J. T. Kell, W. W. Bowman, T. H. Brewer, M. E. Heynes, E. W. Smith, A Dring.

CEDAR VALE—The Dosbaugh Telephone Company. Capital stock, $100,000. President, J. M. Dosbaugh; vice-president, John Dosbaugh; secretary, Louie Adam, Jr.; treasurer, A. I. Adam; manager, F. A. Whartenby.

MAINE.

GREENVILLE—Greenville and Kennebec Telephone Company. Capital stock, $10,000. President, C. D. Shaw; treasurer, H. M. Shaw.

MICHIGAN.

MONROE—Stoddard-Osgood Telephone Company. Capital stock, $10,000.

MINNESOTA.

GRAND MEADOW—The Home Telephone Company. Capital stock, $50,000.

LAC QUI PARLE—The Bellingham Telephone Company. Capital stock, $25,000. President and manager, Lucius F. Clark; vice-president and treasurer, Frederick J. Rosenwald.

WINNEBAGO CITY—The Southern Minnesota Telephone & Telegraph Company. Capital stock, $100,000. President, A. W. Colvin; treasurer, J. A. Reagan; secretary, W. A. Streeter.

BELGRADE—The Commercial Telephone Company. Capital stock, $50,000. President, T. J. Anderson; vice-president, Chris Borgerding; secretary, J. F. Chisholm; treasurer, Alexander Ridgeway.

MISSOURI.

EUREKA—The Eureka Telephone Company. Capital stock, $5,000. Incorporators, Lee E. Monroe, S. Huey, Thomas J. Quinn, N. C. Wright and Herman Dreyer, all of Eureka; P. P. Lewis, Crescent; Martrom D. Lewis, St. Louis.

MONTANA.

LEWISTOWN—Lewistown and Billings Mutual Telephone Company. Capital stock, $20,000. Directors, P. B. Moss, Billings; Thomas Cruse, Helena; F. W. Handel, Musselshell; George M. Stone, G. J. Bach, David Hilger, E. O. Busenburg, Lewistown.

NEBRASKA.

CONCORD—Concord Farmers' and Merchants' Telephone Company. Capital stock, $10,000.

LINCOLN—The Farmers' Mutual Telephone Company of Phelps county has filed articles of incorporation with the secretary of state. Capital stock, $20,000.

AVOCA—Farmers' Mutual Telephone Company. Capital stock, $20,000. Incorporators, Paul Ottens, John Bredenholft, Ernest Stutt, E. B. Taylor, Asa Johnson, C. D. Quinton, Henry Wohler.

UNION—The Nanticoke Telephone and Telegraph Company. Capital stock, $1,000. Directors, William Bronk, Maine; Eugene Andres, Union Center; Clarence Stephens, Union Center; Wayne Woodard, Union Center; Lynn W. Pitkin, Frank Robbin and F. F. Neff of Union.

OHIO.

MEDINA—The Farmers' Telephone Company. Capital stock, $125,000. Incorporators, E. R. Colver, J. C. Fixler, H. F. Rickert, C. C. Kendig, J. Eddy.

FARMERSVILLE—The Farmersville Telephone Company. Capital stock, $10,000. Incorporators, D. E. Heisey, George C. Henkel, J. J. Soastal, A. Gilbert, N. A. Moser.

DORSET—The Dorset Telephone Company. Capital stock, $3,000. Incorporators, H. A McConnell, J. L. Hurst, P. O. Ritter, M. A. Brotzman, W. W. Gates, C. W. Horner.

BATAVIA—New Citizens' Telephone Company. Capital stock, $150,000. Incorporators, B. W. Gilfillin, J. C. Wood, W. H. Baum, Wm. R. Fee, W. Guy Jones, George H. Eveland.

WEST RICHFIELD—The West Richfield Telephone Company. Capital stock, $10,000. Incorporators, Edwin L. Carter, James B. Stauffer, J. B. Kennedy, M. L Newton, Allen S. Prickitt.

WINDSOR—The Windsor Telephone Company. Capital stock, $1,500. Incorporators, C. W. Alderman, C. E. Kinney, F. S. Pond, W. C. Turner, Robert Stewart, P. A. Wilson, V. E. Wisnell.

OKLAHOMA.

ORLANDO—German-American Telephone Company. Capital stock, $5,000. Incorporators, H. C. Arnold, E. E. Cowman, D. L. Kinman.

JET—The Jet Rural Telephone Company. Capital stock, $5,000. Incorporators, J. H. Barnes, R. M. Cavett, J. and W. G. Moorman of Jet; J. P. Miller, T. Andrew, F. P. Carey, C. J. Bontrager, of Timberlake.

OREGON.

BAKER CITY—The Farmers' Mutual Telephone Company.

ESTACADA—The Estacada Telephone and Telegraph Company.

Capital stock, $10,000. Incorporators, M. C. Adkins, B. O. Boswell, John B. Haviland, J. W. Reed, R. A. Stratton.

TEXAS.

BRYAN—The East Dallas Telephone Company. Capital stock, $30,000.

CANYON—Northwest Texas Telephone Company. Capital stock, $10,000. Incorporators, J. N. Donohoo, R. W. O'Keefe, L. T. Lester.

TYLER—White Telephone and Telegraph Company. Capital stock, $10,000. Incorporators, Charles N. White, N. W. White and W. Frank Knox, all of Tyler.

BURKEVILLE—Texas and Louisiana Telephone Company. Capital stock, $500. Incorporators, C. E. Code, J. C. Townsend, E. E. Lanhan of Burkeville and R. D. Cain of Burr's Ferry.

BAIRD—The Home Telephone and Electric Company. Capital stock, $25,000. Incorporators, I. N. Jackson, S. L. Driskill, T. E. Powell, S. H. Ramsey, Bennie Richardson of Baird and J. M. Estes of Clyde.

WEST VIRGINIA.

BUFFALO—The Winfield, Buffalo and Callipolis Telephone Company. Capital stock, $5,000. Incorporators, E. B. Henson, L. Quickley, S. C. Handley, Charles Harris, Buffalo; M. V. Brown and G. E. Skinner, Pliny.

WISCONSIN.

RETREAT—Vernon County Telephone Company. Capital stock, $5,000. Incorporators, A. J. Brodhead, J. L. Davis, W. P. Morand, Anna Esch.

MAPLEHURST—Withee and Maplehurst Telephone Company. Capital stock, $1,000. Incorporators, Wallace D. Clemons, John Christensen.

DOWNSVILLE—The Downsville Telephone Company. Capital stock, $3,500. Incorporators, J. F. Dennham, George McCarty, Uriah Anderson and others.

ANNUAL MEETINGS.

ALABAMA.

MOBILE—At the annual meeting of the Home Telephone Company the following officers and directors were elected: President, John Craft; vice-president, A. S. Lyons; treasurer, A. Proskauer; secretary, R. L. Douglas; manager, W. H. Bryant; directors, John Craft, A. H. Spira, Adam Glass, P. J. Lyons, L. C. Fry.

CANADA.

HAMPTON, N. B.—The Central Telephone Company has elected officers as follows: President, T. H. Estabrook, St. John; vice-president, S. H. White, Sussex; secretary and treasurer, H. P. Robinson.

CALIFORNIA.

SARATOGA—At its annual meeting the Saratoga Mutual Telephone Company elected officers as follows: President, Ralph A. Husted; secretary, James T. Richards; treasurer, Dr. R. L. Hogg; directors, J. M. Lipscomb, W. G. Tomlinson.

FLORIDA.

EUSTIS—At the first anual election of the stockholders of the Eustis Telephone Company the following directors were elected: F. A. Reed, H. W. Bishop, Charles Isted, J. R. Miller, M. V. Hopkins.

GEORGIA.

WASHINGTON—At a meeting of the stockholders of the Wilkes Telephone and Electric Company officers were elected as follows: President, J. A. Moss; secretary and treasurer, Boyce Ficklen.

ILLINOIS.

OSCO—The Osco Telephone Association has elected the following officers: President, J. Heber Smith; secretary and treasurer, Henry Bestor.

VICTORIA—The directors of the Victoria Telephone Exchange have elected officers as follows for the ensuing year: President, J. E. Ericson; vice-president, A. A. Hedstrom; secretary and treasurer,

SIBLEY—The stockholders of the Sibley Telephone Company have elected the following officers for the ensuing year: President, A. A. Absher; vice-president, Otto Fikenscher; secretary, F. A. Warner; treasurer, W. R. Hamilton.

PETERSBURG—At a recent meeting of the stockholders of the Petersburg Telephone Company the following officers and directors were elected: President, George H. Glass, Pekin; secretary, George N. Kelly, Petersburg; treasurer, B. G. Henion, Petersburg.

QUINCY—The stockholders of the Quincy Automatic Telephone Company elected the following officers for the ensuing year: President and treasurer, J. R. Pearce; vice-president, Henry Steinkamp; secretary, W. P. Martindale; directors, George P. Behrensmeyer, F. J. Pennick.

LAKE CITY—At the second annual meeting of the Hammond Telephone Association the following officers were elected: President, O. H. Polson; secretary, J. F. Cook; treasurer, A. F. Polson; directors, J. L. Bakes, A. H. Kruger, Thomas Cook, A. B. Disney, Jay Convers.

CAMP POINT—The Adams County Telephone Company has elected the following officers and directors: President, George W. Cyrus; secretary, Henry G. Henry; treasurer, S. Hardin; manager, Dr. J. K. Lambert; directors, C. M. Henry, W. C. Lytle, O. H. Lawless, N. C. Booth, W. W. Booth.

ROCK ISLAND—The Union Electric Telephone & Telegraph Company at its annual meeting elected the following officers and directors: President, N. Hamilton; secretary, C. A. Lee; treasurer, J. W. Morrison; James Ross, C. A. Lee, J. A. Fritchey, G. B. Stuckey, N. Hamilton, J. W. Morrison, all of Harrisburg, Pa.; Frank Welch, Rock Island.

INDIANA.

RICHMOND—The Richmond Home Telephone Company has elected the following officers: President, A. C. Lindemuth; vice-president, Samuel Dickinson; secretary, James W. Moore; treasurer, John M. Lontz.

LEBANON—The following officers have been elected by the Lebanon Telephone Company: President, S. P. Sherin; vice-president, L. W. Kirtley; secretary and treasurer, W. J. DeVol; assistant secretary, H. B. Sayle.

FREETOWN—The Freetown Telephone Company has been organized with the following officers: President, Isaac Smith; vice-president, O. S. DeLong; secretary, H. H. Tinch; treasurer, R. R. Cross; superintendent, C. C. Tinch.

AURORA—The Mutual Telephone Company has elected the following officers and directors for the ensuing year: President, D. E Clements; secretary and treasurer, C. A. Zeh; J. W. Clements, D. F. Clements, C. A. Zeh, R. A. Sawden, H. N. Christy, G. L. Baker.

ANDERSON—The Delaware and Madison Counties Telephone Company has elected officers as follows: President, A. L. Johnson; vice-president, J. J. Netterville; treasurer, W. E. Hitchcock; secretary and general manager, Thomas Bromley, Jr.; directors, A. L. Johnson, T. F. Rose.

IOWA.

CRESTON—The Creston Mutual Telephone Company has elected the following officers and directors for the ensuing year: President, J. C. Sullivan; vice-president, T. K. Wilson; manager and secretary, Geo. E. Atkinson, John Hackett, Ed A. Aldrich, C. C. Boys.

DES MOINES—The Mutual Telephone Company has elected the following officers for the coming year: President, J. S. Bellamy; vice-president, J. W. Hill; secretary, J. C. Hume; treasurer, L. M. Grimes; directors, M. McFarland, Otto C. Herman, Clyde E. Brenton.

DANVILLE.—The Vermillion County Telephone Company at its annual meeting elected the following officers for the coming year: President, J. H. Davis; vice-president, H. F. Hill; secretary, L. M. Hargis; treasurer, L. D. Glass. The present directors were re-elected.

MEDORA—The stockholders of the Medora Telephone Company have elected the following officers for the coming years: President, E. B. Simmons; vice-president and manager, M. L. Farrow; treasurer, J. P. Roodhouse; directors, John Payne, T. A. Loomis, John Robbings.

NEW ALBIN—The Eitzen and New Albin Telephone Company has re-elected the following officers for the ensuing year: President, Henry Vontherroe; vice-president, Herman Luttchens; secretary, Henry Bisping; treasurer, Fred Becker; trustee, George Wuennecke.

BLOOMFIELD—At a meeting of the stockholders of the Citizens' Mutual Telephone Company officers were elected as follows: President, Chris. McAvoy; vice-president, L. F. Christy; secretary, Chas. Evans; treasurer, Geo. W. Phillips; executive committee, Jerome Brouhard, Frank Martin.

GRINNELL—At the reorganization of the Newburg and Grinnell Telephone Company the following officers were elected: President, J. L. Burroughs; vice-president, N. W. Cox; secretary, Thos. Mason; treasurer, A. H. Palmer; trustees, J. M. Campbell, E. P. Bonsall and John Newcomer.

GALVA—The Galva Telephone Exchange Company has elected the following officers for the coming year: President, Robert Baxter; vice-president, Geo. Clapsaddle; secretary, H. M. Walters; treasurer, Geo. B. Whealen; directors, M. M. Elk, Geo. W. Johns, Jas. Fair, John Williams, Wm. Schmidt.

BOONE—The Boone County Telephone Association has elected the following officers for the ensuing year: President, E. O. Montgomery; vice-president, F. L. Goeppinger; secretary, C. C. Deering; treasurer, O. C. Herman; directors, E. O. Montgomery, F. L. Goeppinger, E. H. Melott, C. C. Deering, O. C. Herman.

ENTERPRISE.—The Peoples' Mutual Rural Telephone Company has elected the following officers for the ensuing year: President, Henry Kruse; vice-president, Chas. Kirtley; secretary, Mathew Francis; treasurer, H. E. Hammon; directors, M. Burrell, J. S. Small, Chas. Huffman, Rob James, C. Burrell, I. Kleckner, P. Miller.

BARSTOW—The Crescent Telephone Company held its annual

meeting at this place and elected the following officers: President, Wm. Whiteside, Joslin; vice-president, A. O'Brien, Barstow; secretary, A. A. Matthews, Erie; treasurer, John Schafer, Port Byron; trustees, Wm. Wilt, Erie; Webb. Donahoo, Coe; Wm. Farber, Port Byron; D. W. Mumma, Zuma; Wm. Zeigler and John Albright, Hampton.

SHELBY—The Shelby Independent Telephone Company has elected the following officers for the ensuing year: President, C. R. Benedict; vice-president, D. C. Cooper; secretary, N. J. Jones.

GRANDVIEW—The Rural Telephone Company has elected the following officers for the coming year: President, W. B. Huff; vice-president, M. Hunter; secretary, C. King; treasurer, George Young.

TAMA—The Salt Creek Valley Telephone Company elected officers as follows: President, E. C. Mason; vice-president, Frank Dvorak; treasurer, E. H. Sapp; secretary, W. P. Wilson; trustees, Fred Shelhorn, John Shafer.

SCHALLER—The Nemaha Mutual Telephone Association has elected the following officers: President, C. N. Searle; vice-president, T. W. Tosland; secretary, G. W. Anderson; treasurer, D. W. Graff; directors, J. C. Hunter, James Mooney, M. D. Rich.

VILLAGE CREEK—The Farmers' Telephone Company has elected officers for the coming year as follows: President, Julius Gruber; secretary, H. A. Hendrickson; treasurer, Wm. Rood; directors, T. Faegre, Geo. Rice, Chas. Hansemeier, John O'Neill.

BIDWELL—The Bidwell Mutual Telephone Company has elected officers for the ensuing year as follows: President, C. R. Chisman; vice-president, John Lock; secretary and treasurer, C. D. Apley; directors, O. W. Johnston, Henry Oswald, O. C. Lock.

MAQUOKETA—The Maquoketa Telephone Company has elected officers as follows: President, H. T. Brigham; vice-president, W. C. Gregory; secretary and treasurer, W. M. Stephens; directors, F. D. Kelsey, W. B. Swigart and the above named officers.

MONDAMIN—The Interstate Telephone Company has elected officers as follows for the coming year: President, W. A. Smith; vice-president, A. Spooner; secretary, C. J. Cutler; treasurer, H. M. Sibsby; manager, John Young; directors, W. J. Burke, John Young, A. Spooner, F. M. Terry, C. J. Cutler.

GRAND MOUND—The annual meeting of the Farmers' Mutual Telephone Company was held at this place recently and the following officers elected: President, A. A. Barber; vice-president, R. D. Allison; secretary, John Meints; treasurer, A. F. Barber; trustee, J. J. Ritter.

FREMONT—At the annual meeting of the stockholders of the Farmers' & Traders' Telephone Company the following officers and directors were elected for the ensuing year: President, S. R. Cannon; vice-president, J. E. Kennel; secretary, T. O. Stewart; treasurer, J. A. Gunn; J. W. Zaring, W. E. Fellers.

DIXON—The German Mutual Telephone Company held its annual meeting at this place and elected the following officers: President, Theo. Peckenschneider, Grand Mound; vice-president, John Grove, Dixon; secretary, Peter Blunck, Grand Mound; treasurer, Gust Eiss, Grand Mound; directors, Rudolph Zindel, Joe Kalendash.

KANSAS.

HOISINGTON—The Russell and Galatia Telephone Company held its annual meeting at this place and elected the following officers and directors: President, Christ Hildebrand; vice-president, M. P. Miller; secretary, A. L. Boyd; treasurer, J. Stecker; R. B. Landon, Conrad Letsch.

KENTUCKY.

BOWLING GREEN—The stockholders of the Home Telephone Company have elected officers as follows for the coming year: President, I. F. Beard, Huntington, Ind.; first vice-president, E. B. Stout; second vice-president, W. B. Mayes; treasurer, J. Whit Potter; secretary, Hubert Myers; general manager, W. L. Allison.

LEXINGTON—The Fayette Home Telephone Company has elected officers as follows for the ensuing year: President, Geo. S. Shanklin; vice-president, A. Smith Bowman; secretary, Charles Kerr; treasurer, J. W. Stoll; directors, John R. Allen, J. Rogers Barr, Dr. David Barrow, Geo. A. Bain, Desha Breckenridge, Joseph S. Botts, A. Smith Bowman, J. S. Brailey, F. A. Bullock, L. G. Cox, W. K. Massie, Geo. K. Graves, Richard Godson, Charles Kerr, J. D. Purcell, C. C. Patterson, John C. Rout, Jonett Shouse, J. W. Stoll, J. T. Shelby, George Shanklin.

MAINE.

PARIS—The Curtis Hill and Paris Telephone Company has elected the following officers for the coming year: President, Charles Dudley; vice-president, Alton Wheeler of South Paris; secretary, W. O Lowery; treasurer, T. L. Wyman.

MICHIGAN.

BENZONIA—The Benzie County Telephone Company has elected W. A. Young president and H. B. Woodward secretary for the ensuing year.

HIGHLAND—The Highland Telephone Company has re-elected its old officers as follows: President, W. S. Seaver; vice-president, Wm. H. Cook; secretary, F. S. Keller; treasurer, Geo. S. Potts.

SARANAC—At the annual meeting of the Saranac Telephone Company the following officers were elected: President, S. M. Crawford; vice-president, M. D. Lord; secretary, Henry Frace; treasurer, T. S. Barber; superintendent, F. W. White.

SAUGATUCK—At the annual meeting of the directors of the Saugatuck and Ganges Telephone Company officers were elected as follows: President, A. H. Tracy, Glenn; secretary, Edward Hawley, Fennville; treasurer, S. C. Read, Saugatuck; general manager, Edward Hutchins.

SYRACUSE—The Syracuse Telephone Company has elected officers and directors as follows for the ensuing year: President, J. J. Jermyn; vice-president, H. W. Plumb; secretary, A. R. Peck; treasurer, R. G. Jermyn; general manager, F. M. Potter, Jr.; J. L. Wentz, H. A. Moyer, A. A. Howlett.

ALPENA—The Mutual Telephone Company has elected the following officers for the ensuing year: President, Chas. H. Reynolds; secretary and treasurer, W. H. Johnson; directors, C. H. McKim, C. H. Reynolds, W. H. Johnson, J. J. Potter, F. W. Fletcher, W. D. Comstock, John Monaghan.

WATERLOO—At a recent annual meeting of the Waterloo Rural Telephone Company officers were elected as follows: President, Delancy Cooper; vice-president, F. E. Ives; secretary, L. M. Milner; treasurer, T. A. Stevens; directors, Thomas Howlett, Orville Jones, Frank S. Kadan, Wm. Howlett, B. W. Sweet.

TRAVERSE CITY—The stockholders of the Traverse Bays Telephone Company recently elected the following officers: President and general manager, Theodore Guyer; secretary, Elias Burns; treasurer, L. Armstrong; directors, F. L. Church, Theodore Guyer, Elias Burns, L. Armstrong, George Hochbridge, John Giles.

LIVINGSTON—At the annual meeting of the Livingston Mutual Telephone Company the following officers were elected: President, H W. Norton, Marion; vice-president, E. A. Kuhn, Gregory; secretary, H. E. Reed, Marion; treasurer, A. J. Van Patten; directors, E. A. Kuhn, F. T. Hyne, S. E. Swattout, A. E. Cole, W. O. Richards, R. R. Smith.

BENTON HARBOR—The Twin City Telephone Company at its annual meeting elected the following directors: W. A. Preston, E. N. Hatch, J. R. Price, John Robinson, F. Morley.

ADRIAN—The Adrian Telephone Company has elected the following officers for the ensuing year: President, D. M. Baker; vice-president, W. O. Hunt; secretary, C. S. Parke; treasurer, George A. Wilcox.

FENNVILLE—Saugatuck and Ganges Telephone Company has elected the following officers for the ensuing year: President, A. H. Tracy, Glenn; secretary, Edward Hawley, Fennville; treasurer, S. C. Reed, Saugatuck; general manager, Edward Hutchins.

HAMILTON—The Hamilton Mutual Telephone Company at its annual meting elected the following officers: President, M. E. Hoadley; vice-president, John Lohman; secretary and treasurer, John Michmerhuizen; trustees, Dr. Geo. Rigterrink, E. A. Dangremond, S. Hallentha.

CAMDEN—The Camden Rural Telephone Company has elected the following officers for the coming year: President, Henry Haynes; vice-president, Geo. A. J. Palmer; secretary, S. E. Haughey; treasurer, B. R. Alward; directors, S. S. Townsend, Jas. Crow, Chas. Small, Alfred Small, F. W. Rowe.

MINNESOTA.

MOORHEAD—The stockholders of the Red River Telephone Company have elected the following officers: President, P. H. Lamb; vice-president, L. H. Baker; secretary and treasurer, Leslie Welter.

LAKE CRYSTAL—The Blue Earth Telephone Company has elected the following officers and directors: President, Elliot Upson, Judson; secretary, David E. Bowen, Cambria; treasurer, D. E. Crane, South Bend; directors, W. J. Wigley, John L. Evans.

PERHAM—The Perham Telephone Exchange has elected the following officers: President, F. L. Weber; secretary, J. H. Shea; treasurer and manager, I. E. Davison.

ALBERT LEA—The annual meeting of the Albert Lea Telephone Company has been held at this place and the following directors elected: George W. Johnson, S. Strauss, Clint L. Luce, F. W. Barlow, C. F. Towne, H. A. Morgan, D. C. Armstrong.

AUSTIN—At the annual meeting of the new Tri-State Telephone Company the following officers were elected: President, A. O. Dinsmore; vice-president, Thomas Revord; secretary and treasurer, James Keenan; directors, C. A. Sterling, C. H. Webber.

MERTON—The Merton Telephone Company has elected officers as follows for the ensuing year: President, L. D. Carleton; vice-president, G. M. Flinn; secretary, N. O. Partridge; treasurer, J. C. Mooney; trustees, F. B. Tuttle, William King, W. W. White.

GREENLAKE—The Harrison Union Telephone Company has elected the following officers for the ensuing year: President, S. M. Dahl; vice-president, Peter Bergland; secretary, Wesley Sanders; treasurer, A. E. Dahl; directors, Moses DeFoe, J. A. Massers, Henry Mohr, Wm. Nelson, Ole Haverly.

LE SUEUR—The Farmers' and Merchants' Mutual Telephone Company at its annual meeting elected the following officers: President, H. Weckworth; first vice-president, Dr. F. A. Dodge; second vice-president, M. McCourtney; secretary, A. H. Nelson; directors, M. Lokensgarad, A. J. Wieland, C. J. Oldenberg.

MISSOURI.

MONTICELLO—The stockholders of the Citizens' Telephone Company held their annual meeting at this place recently and elected the following officers and directors for the coming year: President, J. B. Blackburn; vice-president, Harvey Burgess; secretary, G. W. Vaughn; treasurer, J. F. Gnuse; general manager, C. O. Raine; M. H. Rouse, Thomas Lillard, Pike Hanna, George Becker, John Stevenson, John T. Bower, Jr., B. S. Bozarth, Charles Little.

LA BELLE—The La Belle and Colony Telephone Company has elected the following officers for the ensuing year: President, G. W. McRae; secretary, Robert Brightwell; manager, Charles House.

ST. LOUIS—At the annual meeting of the stockholders of the Kinloch Telephone Company the old directors were re-elected as follows: William F. Nolker, Rollo Wells, August Gehner, Philip Stock, Adolphus Busch, C. Marquard Forster, Julius S. Walsh, William D. Orthwein, William J. Lemp, Charles H. Turner, Sam M. Kennard, Henry Nicolaus, Breckenridge Jones.

NEBRASKA.

HASTINGS—The Hastings Independent Telephone Company held its annual meeting in this place recently and elected the following officers and directors: President, R. A. Batty; vice-president, J. N. Lyman; treasurer, W. A. Taylor; secretary, H. E. Stein.

HOOPER—The Hooper Telephone Company has elected the following officers and directors for the coming year: President, E. O. Speilberg; vice-president, Herman Meyer; secretary, J. Howard Heine; treasurer, T. W. Lyman; manager, M. E. Shipley; T. B. Pawling, Bernard Monnich.

SEWARD—The Independent Seward County Telephone Company has elected the following officers for the ensuing year: President, J. A. Divan; vice-president, W. Stolz; secretary, C. J. Cooper; treasurer, Wm. Gade; manager, E. W. Fuller; directors, August Wade, C. D. Decker and others.

LEIGH—The Leigh Independent Telephone Company has elected officers as follows: President, F. Moeler; vice-president, J. H. Loery; secretary, J. H. Pieper.

NEBRASKA CITY—The Nebraska City Telephone Company has elected the following officers for the ensuing year: President, H. A. Duff; vice-president, Henry Schwake; secretary and treasurer, A. M. Munn.

RAVENNA—The directors of the Ravenna Telephone Company recently elected the following officers: President, Chester Holloway; vice-president, J. E. Adamson; general manager, Clyde Carlos.

PLATTSMOUTH—At the annual meeting of the stockholders of the Plattsmouth Telephone Company the following officers were elected: President, Thomas E. Parmele; vice-president, C. C. Parmele; treasurer and general manager, T. H. Pollock; secretary, J. N. Wise.

SUTTON—At the annual meeting of the stockholders of the Sutton Telephone Company the following officers and directors were elected: President, P. H. Schwab; secretary, W. F. Hoerger; treasurer, Charles Braun; J. B. Fredericks, J. Van Patten, F. J. Hoerger, L. B. Stiner.

AURORA—The Hamilton County Farmers' Telephone Association has elected the following officers for the ensuing year: President, D. L. Toof; vice-president, J. K. Hartnell; secretary, C. L. Chapman; treasurer, F. C. Putnam; directors, J. A. Cavett, Theodore Nordgren, J. A. Moses.

CRETE—At the annual meeting of the Dawson-Nemaha Telephone Company, held at this place, officers were elected as follows: President, Joseph G. Heim; vice-president, J. G. McGinis; secretary, N. B. Judd; treasurer, Jonas Helm; directors, W. G. Hummel, Oliver Ayers, G. W. Wiltse, together with the above named officers.

NEW YORK.

ALBANY—The Albany Telephone Company has elected the following directors for the ensuing year: J. W. Kerlin, Geo. R. Williams, C. M. McNeese, C. H. Kent, Thos. S. Gillespie, Chas. O. Petten, Dr. Barger.

ALEXANDER BAY—The Alexander Bay Telephone Company has elected officers as follows: President, G. L. Olds; secretary and manager, William E. McDonnell; treasurer, Chas. U. Putnam.

BATAVIA—The Stafford Telephone Company at its annual meeting elected the following officers and directors: President, Charles J. Call; secretary, Dr. Ganaird; treasurer, Howard Bell; Walter Daniels, Jay Lathrop, J. A. North, G. H. Torrey.

HORNBY—The Hornby Telephone Association has been reorganized with the following officers and directors: President, H. T. Jimmerson; vice-president, C. R. Adams; treasurer, C. C. Roloson; secretary, A. C. Gifford; Walter Davis, E. J. Easterbrook, Edwin Dodge.

NAPLES—The Ontario and Steuben Telephone Company at its annual meeting selected the following officers: President, J. Edward Lyon; secretary, W. W. Holcomb; treasurer, W. H. Housel; auditor, C. L. Lewis; directors, H. W. Blake, O. D. Cottrell, C. L. Lewis, George A. Bolles.

LITTLE FALLS—The stockholders of the Interstate Telephone Company has elected the following officers and directors: President, Eugene Walrath; vice-president, John Hurley; secretary, George K. Hakes; treasurer, George D. Smith; T. M. Brush, I. H. Griswold, George H. Tuttle.

BIRMINGHAM—The Chenango Valley Telephone Company has elected the following officers: President, Charles J. Hayes, Hydeville; vice-president, William E. Edgerton, Greene; secretary, Fred B. Skinner, Greene; treasurer, William H. Ransom; general manager, F. M. Harding, Chenango Bridge.

RED CREEK—The Westburg, Red Creek & Wolcott Telephone Company has elected the following officers for the ensuing year: President, H. C. Rorabeck; vice-president, George Carkner; secretary, C. E. Wendover; treasurer, George W. Cramer; directors, Charles Madan, William P. Burgdorf, Charles Longyear, George Carkner, Dr. Plumb.

CORTLAND—The Home Telephone Company has elected the following officers: President, Dr. C. D. VerNooy; vice-president, C. P. Walrad; secretary, H. L. Smith; treasurer, G. J. Mayer; attorney, R. L. Davis; manager, F. V. Bennett; directors, C. D. VerNooy, C. P. Walrad, H. L. Smith, G. J. Moyer, R. L. Davis, William Martin, A. S. Burgess, W. H. Foster, Frank E. Price.

HAMLIN—The stockholders of the Hamlin Telephone Company at their annual meeting elected officers as follows: President, David R. Singleton; vice-president, Chris Roth; secretary, Henry F. Newman; treasurer, Charles Baase; directors, David R. Singleton, Chris Roth, John Martin, Henry F. Newman, Blaino Snook, Isaac Palmer, James G. Barry, T. O. Swanson, Charles Baase.

HERKIMER—The County Telephone Company of Herkimer has elected officers as follows: President, Robert Earl; vice-president James Conkling; secretary, Chas. H. Poole; treasurer, W. I. Taber; directors, George W. Fuller, Fred Zoller, W. I. Taber, Robert Earl. Call; secretary, Dr. Ganiard; treasurer, Howard Bell; directors, Charles J. Call, Howard Bell, Walter Daniels, Jay Lathrop, J. A. North, G. H. Torrey, Dr. Ganiard.

MIDDLEBURGH—At the annual meeting of the Middleburgh Telephone Company the following officers were elected: President, C. S. Best; vice-president, D. D. Frisbie; treasurer, J. E. Young; secretary, Dow Beekman; attorney, G. L. Danforth; directors, C. S. Best, D. D. Frisbie, J. E. Young, J. B. Badgley, A. E. ReQua, Dow Beekman, C. W. Vroman, J. H. Weckle, G. L. Danforth, J. L. Engle, J. H. Cornell, M. W. Baker, W. E. Bassler, A. B. Engle, Lydia A. Becker.

WILLIAMSON—At a recent meeting of the Wayne County Telephone Company held in this place Ledyard S. Cuyler was elected vice-president and director to succeed Hon. L. T. Yeomans, resigned.

CHURCHVILLE—The directors of the Churchville Telephone Company have elected the following officers: President, William L. Ormrode; vice-president, C. H. Briscoe; secretary, C. G. Stewart; treasurer, F. W. Potter.

FRANKFORT—The Frankfort Hill Telephone Company has elected the following officers for the ensuing year: President, George Sases; secretary, S. P. Weaver; treasurer, H. H. Ingham; superintendent, C. W. Wetmore.

LYONS—The Wayne County Telephone Company has elected the following officers and directors: President, Charles A. Lux; vice-president and general manager, John A. Driscoll; secretary and treasurer, Judson L. Transue; J. Seldon Brandt, Albert Yeomans, Ledyard S. Cuyler, Chas. H. Towlerton.

PORT BYRON—The Rural Telephone Company of Port Byron has been organized with the following officers: President, C. W. Weston; vice-president, F. S. Root; secretary and treasurer, H. R. Warren; directors, H. R. Warren, F. A. Mead, Addison Cole, John Monroe, T. M. Crane, F. S. Root, all of Port Byron.

ALBANY—At the annual meeting of the Independent Union Telephone Company the following officers and directors were elected for the ensuing year: President, Samuel B. Rawson; vice-president, Irving H. Griswold; secretary and treasurer, Theodore M. Brush; Frederick H. Sudro, Frederick M. Maston, Addison E. Lord.

BERGEN—The Bergen Telephone Company has elected the following officers for the ensuing year: President, G. M. Gillette; vice-president, J. S. Gleason; secretary, Holden Miller; treasurer, C. E. Housel; directors, Dr. R. M. Andrews, Dr. W. F. Smeltzer, W. E. Gillette, W. M. Sage, G. E. Parish, G. A. Johnson, G. E. Best, George Sands.

LOWVILLE—The Black River Telephone Company has elected the following officers and directors for the ensuing year: President, Charles W. Pratt, Boonville; vice-president, George R. Fuller, Rochester; treasurer, Charles J. Poole, Utica; secretary, S. C. Capron, Boonville; manager and assistant secretary, John J. Lomser, Lowville: Fred W. Zoller, T. Harvey Ferris.

NEW JERSEY.

TRENTON.—The Interstate Telephone Company has elected the following directors for the ensuing year: W. S. Hancock and Barker Gummere, Jr., Trenton; Governor-elect E. C. Stokes, Millville; H. H. Hamill, Trenton; H. C. Loudenslager, Camden; C. W. Kline, Hazelton, Pa.; John Markle and A. C. Markle, New York; G. N. Reichard, Wilkesbarre; R. P. Wilson, Trenton; Louis Kuehule, Atlantic City; J. W. Crellin, Hazelton; Thomas Daugherty, Allentown; F. A. Demarest, Trenton.

OHIO.

SIDNEY—The Sidney Home Telephone Company has elected the following officers: President, W. H. Wagner; vice-president, I. H. Thedrick; secretary, A. J. Hess; treasurer, L. M. Sturdevant.

RICHWOOD—The stockholders of the Richwood Telephone Company have elected the following directors: O. P. Lenox, C. McAllister, L. G. Peet, L. H. Osborne, E. E. Moore, W. H. Lenox, H. C. Dullee.

CONNEAUT—The Conneaut Telephone Company has elected officers as follows: President, H H. Hunt; vice-president, B. S. Snyder; treasurer, G. M. Brown; secretary and general manager, M. Goebricher; directors, C. W. Pelton, R. W. Mitchener, T. B. Blood.

UNIONTOWN—The Tri-county Telephone Company elected the following officers and directors: President, Dr. M. M. Bauer; vice-president, J. W. Richards; secretary, J. E. Schrantz; treasurer, A. F. Nesse; N. B. Biddleman, Geo. Young, Elihu Swinehart, Frank Pfeiffer.

FREMONT—The Fremont Home Telephone Company has elected officers as follows for the coming year: President, S. Brinkerhoff; vice-president, C. M. Russell; secretary, Joseph Horn; treasurer, J. M. Sherman; directors, James Hunt, A. W. Overmeyer, T. M. Brush, A. E .Lord.

VERMILLION—The Vermillion Telephone Company has elected the following directors: E. L. Coen, Jacob Englebry, Edwin Fledderjohn, John Moes, H. B. Kishman, M. E. Lawless, Charles McGraw, C. L. Phelps, R. F. Quigley, G. P. Wahl, E. B. Wahl, E. B. Welch, George B. McConnelly.

HAMILTON—The directors and stockholders of the Home Telephone Company at their annual meeting elected the following officers and directors: President, Frank Hughes; vice-president, Charles Greismer; secretary, J. W. Sloneker; treasurer, F. W. Whitaker; manager, W. G. Thompson; O. M. Bake, J. C. Slayback, F. W. Barden.

DELAWARE—At its annual meeting the citizens' Telephone Company elected the following officers: President, W. M. Heseltine; vice-president, W. G. Hormell; secretary and general manager, G. H. Carter; treasurer, F. P. Hills; directors, W. M. Heseltine, G. H. Carter, W. G. Hormell, W. Guy Jones, Dr. W. B. Hedges, O. D. Young, J. L. Anderson, Dr. A. J. Pounds, A. C. Barrows.

COLUMBUS—The stockholders of the Citizens' Telephone Company have elected the following officers for the ensuing year: President, H. A Lanman; vice-president, John Joyce; secretary-treasurer, E. R. Sharp; counsel, Frank A. Davis; general manager, Frank L. Beam; directors, Frank A. Davis, E. R. Sharp, Frank L. Beam, H. A. Lanman, John Joyce, Cyrus Huling, L. D. Hagerty, J. B. Hanna, Harry Daugherty.

LEBANON—The Valley Telephone Company has elected the following directors: O. M. Bake, G. E. King, H. S. Conover, Gibson Lowe, James Sctops.

OXFORD—The Oxford Telephone Company has elected the following directors: Lynn Bonham, S. H. Alen, Dr. C. O. Munns, E. E. Williams, John Hutchison.

MIFFLIN—The Monroe Telephone Company has elected the following directors: James H. Secrist, Jacob Snyder, Charles Basore, James H. Hunt, John C. Ohler, L. K. Pierce, D. B. Leiter.

WESTON—The Weston Home Telephone Company has reorganized and elected the following officers for the ensuing year: President, Samuel Murphy; treasurer, Dr. G. B. Spencer; directors, W. A. Dewese, J. E. Clark, J. H. Cline, C. K. Ross, W. R. Swerline.

REEDS MILLS—The Reeds Mills Telephone Company has elected the following officers for the coming year: President, George Leech; treasurer, Elmer Gilkinson; secretary, Ollie Welday; general manager, Will Carson; directors, Will Leech, John Porter, George Jewell.

COLUMBIANA—At its annual meeting the Fairfield Township Telephone Company elected the following officers for the ensuing year: President, O. C. Van Skiver; secretary, E. J. Longanecker; treasurer, H. W. Forney; general manager, J. W. Weaver; directors, J. W. Weaver, J. L. Wisler, E. J. Longanecker, E. B. Lower, H. W. Forney, E. C. Rupert, Ira Searchrist, O. C. Van Skiver, J. Winkle.

OKLAHOMA.

ERICK—The Erick-Delhi Mutual Telephone Company at its annual meeting elected the following officers: President, C. M. Sutton; vice-president, J. D. Warford; directors, Joseph Pyle, A. P. McCubbins, C. S. Yarberry.

PENNSYLVANIA.

PITTSBURG—At the annual meeting of the Pittsburg and Allegheny Telephone Company officers were elected as follows: President, J. G. Splane; vice-president, John S. Weller; treasurer, R. C. Hall; secretary and assistant treasurer, T. G. Davis; directors, R. C. Hall, J. G. Splane, H. B. Beatty, D. P. Reighard, R. H. Binns, J. M. Clapp, Ralph E. Flinn, George R. Webb, John S. Weller.

ANDOVER—The Andover Electric Telephone Company has elected the following officers for the ensuing year: President, N. H. Bishop; vice-president, William Webb; secretary, J. H. Hipple; manager, C. E. Harmon.

ALLENTOWN—At the annual meeting of the Consolidated Telephone Companies of Pennsylvania the following directors were elected: George R. Bedford and W. A. Lathrop, Wilkesbarre; William L. Connell, Scranton; A. P. Trautwein, Carbondale; Frank M. Green and J. P. Helfenstein, Shampkin; C. W. Kline and Alvan Markle, Hazleton; Isaac Heister, A. J. Brumbach and W. Lerper Stevens, Reading; Robert E. Wright, William J. Hartzell, George O. Albright and Thomas Daugherty, Allentown.

SOUTH DAKOTA

SIOUX FALLS.—The South Dakota Telephone Association elected the following officers: President, C. B. Kennedy, Canton; vice-president, J. A. Steninger, Parker; secretary-treasurer, H. B. Hartwell, Irene. By unanimous vote it was decided to hold the next annual meeting in Sioux Falls, January, 1906.

TEXAS.

LIVINGSTON—The Livingston Telephone Exchange has elected the following officers and directors for the ensuing year: President, S. H. Smith; secretary, J. E. Hill, Jr.; L. F. Gerloch, G. F. Sawyer, Dr. B. C. Marsh.

SMITHVILLE—At the annual meeting of the Smithville Independent Telephone Company the following officers were elected: President, H. C. Schumacher; vice-president, W. D. C. Jones; secretary and treasurer, J. W. Moore; manager, W. F. Lowen.

VERMONT.

CABOT—The Union Telephone Company at its annual meeting elected the following officers: President, Earl Bliss; vice-president, R. M. Pray; secretary, E. W. Peck; treasurer, W. B. Lance.

ST. ALBANS—At a recent meeting of the Franklin County Telephone Company the following officers were elected: President, Jasper N. Keller, Boston; vice-president, J. H. Abbott, Gouverneur, N. Y.; treasurer, E. S. Willard, Boston; secretary, S. W. Flinn, St. Albans; auditor, E. W. Longley, Boston.

CHELSEA—The Orange County Telephone Company at a recent meeting elected the following officers for the ensuing year: President, C. L. Spear, West Corinth; vice-president, Geo. Crane, Randolph; secretary-treasurer, F. V. Williams.

WEST VIRGINIA.

PARKERSBURG—The stockholders of the West Virginia and Western Telephone Company elected the following directors for the ensuing year: R. P. Brown, S. E. Carle, A. C. Davis, R. R. Rutherford, J. P. Sharp, J. H. Liningher, Dr. G. D. Jefferies, R. Wanlers, S. G Feller, B S. Pope, C. T. Hiteshew.

WISCONSIN.

EDGAR—At the annual meeting of the Edgar Telephone Company the old officers were re-elected as follows: President, A. W. Puchner; vice-president, C. C. Barrett; secretary, A. J. Cherney; treasurer, Otto Fehlhaber.

BARABOO—At the annual meeting of the Baraboo Telephone Company it was decided to reduce the board of directors from five to three. The new officers are Dr. Chas. Gorst, president; H. L. Halsted, vice-president; A. F. Fisher, secretary and treasurer.

GRAND RAPIDS—The Wood County Toll Line Company has elected the following officers and directors: President, Theo. A. Lipke; secretary and treasurer, C. F. Kruger; R. J. Kraus, Dr. Doege, of Marshfield; Dr. M. B. Wood, Pittsville; J. A. Gaynor, L. M. Schlatterer.

CAMBRIA—The Farmers' Telephone Company held its annual meeting at this place and elected the following officers for the ensuing year: President, P. M. Cunningham; vice-president, Rowland Jones; secretary, Polson Baillies; treasurer, Wm. Cunningham; directors, Wm. Gorsuch, John Detman, Chas. Hopkins.

OAKFIELD—At the annual meeting of the stockholders of the Oakfield Telephone Company the following officers were elected: President, Dr. C. H. Moore; vice-president, George Day; secretary, W. E. Bristol; treasurer, C. H. Moore; manager, T. E. Worthing; directors, F. Palmer, T. E. Worthing, W. E. Bristol, W. C. Ehrhardt.

WEYAUWEGA—The Consolidated Telephone Company has elected the following officers for the ensuing year: President, A. L. Hutchinson, Weyauwega; vice-president, M. J. Hogan, Milwaukee; secretary-treasurer, N. W. Low, Weyauwega; general agent, John Kidd, Milwaukee; general superintendent, O. Morsman, Dodgeville; directors, A. L. Hutchinson, N. W. Low, M. J. Hogan, John Kidd, J. B. Egan.

EAU CLAIRE—The Eau Claire Telephone Company has elected the following officers: President, C. A. Silkworth; secretary and treasurer, C. W. Cheney.

MONROE—The Monroe Telephone Company has elected the following officers and directors for the coming year: President, C. W. Twining; vice-president, Dr. W. B. Monroe; secretary, F. A. Shriner; treasurer, J. C. Penn.

BRODHEAD—The Brodhead Telephone Company has elected the following directors for the ensuing year: A. S. Moore, A. Broughton.